Official Publication of the United States Geospatial Intelligence Foundation

Geospatial Intelligence Forum

GEOINT Engineer

Lt. Gen. Robert L. Van Antwerp Jr.

Chief of Engineers, U.S. Army
Commanding General, Army Corps of Engineers

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Volume 8, Issue 8

Full Motion Video ★ Intelligence on Demand ★ Cloud Computing
Letitia A. Long ★ Cloud Storage

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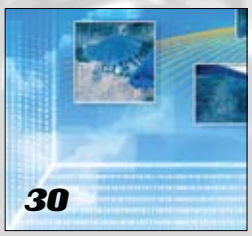
FEATURES

Full Motion Progress
A number of technology developments are contributing to the increased availability of and demand for full motion video by the military and intelligence communities.
By Peter Buxbaum

GEOINT Power in Your Hands
In remarks at the GEOINT 2010 Symposium, NGA Director Letitia A. Long called for providing on-demand access and broadening and deepening our analytic expertise.

Imagery Access
A new Web-based service that offers an 8.5 petabyte database of more than 130 million images helps overcome the limitations of commercial services for many government agencies.
By Art Kalinski

GEOINT in the Cloud
Geospatial Intelligence Forum recently posed the following question to some of the leading companies in the GEOINT field: "What role will cloud computing play in the future of geospatial intelligence?"



The Storage Cloud
Cloud storage solutions introduce a new approach to global data management, greatly simplifying the task of managing the data workflow through its lifecycle.
By Howard Levenson, Scott Fadden and Gabe Chang

COVER / Q&A

Lieutenant General
Robert L. Van Antwerp Jr.
Chief of Engineers,
U.S. Army
Commanding General,
Army Corps of Engineers

DEPARTMENTS

INDUSTRY INTERVIEW

Steve Wood
Vice President
Defense and Intelligence Programs
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EDITOR'S PERSPECTIVE

When I was a kid in Texas, the only television station in town had neither a network affiliation nor, apparently, any fast way to get content from distribution centers to our relatively isolated location. So the schedule, at least in my memory, was dominated by such programming as live local wrestling, the Army's "The Big Picture" and the National Association of Manufacturers' "Industry on Parade."

Since then, of course, the broadcast networks have moved light-years ahead, creating a massive technological edifice for distribution and quality control that is able to manage everything from lip synchronization to the correct regionalization of commercials.

The military and intelligence communities have also made huge strides in their use and control of video content, which has become one of the most important tools in the fight against terrorism. But it's also well-known that they are struggling to cope with a tsunami of this type of ISR information, and it's not a great leap to suggest they might have a lot to learn from the broadcast industry.

That idea, which is already an important theme at the broadcast industry's annual NAB Show, was also the premise of a recent workshop sponsored by the U.S. Geospatial Intelligence Foundation and the NAB Show, entitled "Mastering the Transition to Digital."

As the workshop program notes, broadcasters not only create content, but they also tag it, store it, show it to viewers and use it for other purposes—exactly the kinds of things the military and intelligence communities need to do, and could benefit from industry "lessons learned."

Still, introductory remarks by James Martin, director of ISR programs within the Office of the Under Secretary of Defense for Intelligence, suggested to me that national security agencies also have unique needs that aren't covered by broadcast industry examples, and may even run counter to commercial goals. He pointed in particular to the need for automated analysis capabilities, so that users don't have to stare at their screens for hours on end.

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PROGRAM NOTES

Commercially Hosted Infrared Payload Passes Test

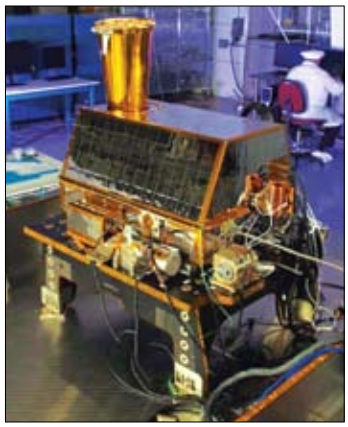
The Air Force Space and Missile Systems Center (SMC), SES World Skies U.S. Government Solutions, Orbital Sciences Corp., and Science Applications International Corp. (SAIC) team have completed the Commercially Hosted Infrared Payload (CHIRP) integrated sensor functional test.

This is the first test demonstrating the high-level functionality of the CHIRP sensor, operating through the Orbital Secondary Payload Interface, and commanded from the CHIRP Mission Analysis Center (CMAC) interface, located in Seal Beach, Calif. The CMAC monitored activities from Orbital as the team successfully passed test images through the system. The CHIRP sensor was delivered to Orbital by SAIC in July.

CHIRP utilizes a telescope that can view a quarter of the Earth from geosynchronous orbit, and is capable of high frame rate imaging in four specific spectral bands. The large format focal plane arrays accommodate a wide-field-of-view infrared staring system, and at the same time reduce cost and complexity.

Developed and delivered in less than two years, the CHIRP wide-field-of-view Overhead Persistent Infrared system is the result of collaboration between the SMC, Air Force Research Laboratory, SES, Orbital and SAIC. This is the first time a USAF payload is a secondary payload on a commercial mission, which reduces total system costs through the use of a previously-developed commercial satellite.

"The ongoing success of this program is proof-of-concept that a variety of government missions can be served by special purpose payloads hosted on commercial spacecraft," said Stu Shea, SAIC group president. "The space-qualified payload enables our Air Force customer to field the required capability in a rapid-response fashion, and demonstrates that the acquisition process can acquire and field important space capabilities."



Hyperspectral Imaging Satellite Passes Milestone

NASA's first hyperspectral imager in space, built by Northrop Grumman for the Goddard Space Flight Center, is observing its 10th anniversary on-orbit, outliving its design life by 1000 percent. Originally designed for one year of operation with a two year goal, Hyperion continues to deliver highly detailed observations of the Earth's surface, atmosphere and biomass.

Built in just 12 months and launched onboard NASA's Earth Observing-1 (EO-1) satellite on November 21, 2000, Hyperion has produced more than 50,000 images in the last decade. Optimizing the sensor's performance is a Northrop Grumman-built long-life pulse-tube cryocooler that has also operated flawlessly for 10 years.

Hyperion was the first hyperspectral imager to demonstrate the value of space-based hyperspectral data used by the nation's science teams and commercial and military users. Hyperion's data products have proved their utility for worldwide land-cover studies, ecosystem monitoring, mineral and petroleum prospecting and agricultural crop discrimination and assessment, among other important applications.

The company is continuing to develop sensor capabilities and associated enabling technologies.

One of three science instruments aboard EO-1, Hyperion is designed to view the Earth in 220 spectral bands ranging from the visible through short wave infrared. Hyperion was the first space sensor to show that vegetation biomass, atmospheric carbon content and carbon uptake of the oceans, which are important elements of climate change measurement, can be monitored using hyperspectral data.

Correction

The story "LiDAR's New Dimension," which appeared in the October 2010 issue of *Geospatial Intelligence Forum*, incorrectly stated the history of the BuckEye aerial surveillance system. BuckEye was developed by the Army Geospatial Center out of the warfighter's need for unclassified high-resolution geospatial data for tactical missions.

PEOPLE

Rear Admiral (lower half) Paul B. Becker will be assigned as vice director for intelligence, J2, Joint Staff, Defense Intelligence Agency.

Brigadier General Gregg C. Potter has been assigned as commanding general/ commandant, U.S. Army Intelligence Center of Excellence and Fort Huachuca, Ariz.

Urban Mapping Inc., a Web mapping and on-demand data service provider, has hired **John Marshall** as chief technology officer.

Dr. William L. Ballhaus

GeoEye has appointed **Dr. William L. Ballhaus** to serve on its board of directors. The appointment of Ballhaus, a senior adviser and operating partner at Cerberus Operations and Advisory Co., follows the closing of GeoEye's financing arrangement with Cerberus Capital Management, in which GeoEye partnered with Cerberus to provide financing to support its bid on the National Geospatial-Intelligence Agency's EnhancedView program.

PCI Geomatics, a developer of geo-imaging software and systems, has announced the appointment of **Terry Moloney** as its new president and chief executive officer.

ITT Corp's Geospatial Systems has appointed **Julie Peffer** vice president and controller for its Rochester, N.Y.-based business.

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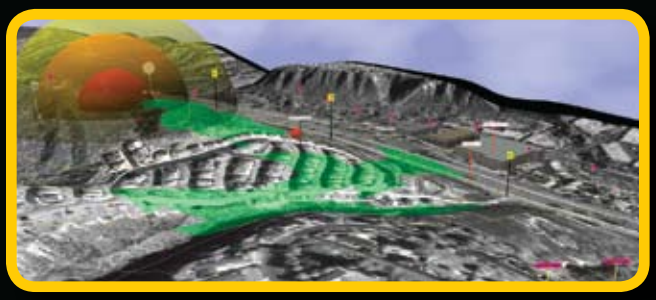

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OVERWATCH

Full Motion Progress

Demand for and access to full motion video is driving the need for more sophisticated analysis and exploitation tools.

By Peter Buxbaum
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During several intelligence postings with the Army and Department of Defense, Brigadier General Brian Keller (Ret.), saw firsthand how the deployment and analysis of full motion video dramatically aided the U.S. war effort in Iraq.

"One factor that made the surge in Iraq successful," he related, "was our ability to successfully target al-Qaeda leadership as well as their media centers and bomb making facilities. These successes were related to the increased availability of full motion video.

"Video allows you to discern patterns of life and behaviors associated with people and the networks they operate in," explained Keller, now a senior ISR strategist at Science Applications International Corp. (SAIC). "It leads us to other locations and people and provides an opportunity to surveille them. Observing patterns of people coming and going often leads to an opportunity to conduct a raid. These operations often result in the capture of people and equipment, and they provide further information that allows analysts and operators to move to the next objective. Instead of finding a needle in a haystack, we're finding needles within needles."

Cmdr. Joe Smith

Jane Bernat

jbernat@overwatch.textron.com

There is no question about the increased demand in the military and intelligence communities for access to and analysis and exploitation of full motion video. Experts say this is driven by the explosion in the number of available sensors and platforms that provide FMV: A few dozen assets 10 years ago have become thousands today. Estimates indicate that the equivalent of 17 years of video was taken in theater in 2009. The demand for and access to video also drives the need for more sophisticated analysis and exploitation tools, which industry is in the process of developing and introducing.

A number of technology developments contribute to the increased availability of and demand for full motion video by the military and intelligence communities. Besides the numbers of platforms and sensors able to provide FMV, the trend has also been driven by the increase in the available bandwidth, noted Commander Joe Smith, technical executive for the sensor assimilation division at the National Geospatial-Intelligence Agency, allowing video to be pushed and pulled to and from the edge of the network to its core.

"There has also been a massive increase in the use and availability of video technology," said Smith. "Young soldiers and sailors are used to sending and receiving video. There has also been an increase in processing capabilities and in the ability to store data."

Beyond Snapshots

The key added value that video brings over still imagery intelligence is the ability to observe targets over time. "One of challenges of still imagery is that it only provides snapshot in time," said Charlie Morrison, director of spatial solutions business development at Lockheed Martin. "With video you can learn more about enemy activity."

"Video allows persistence," added Jon Armstrong, director of FMV solutions at Lockheed. "It allows for activity-based decision making. U.S. forces

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Jon Armstrong

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can target a vehicle, for example, by understanding where it is coming from or where it is going."

In other words, FMV provides a capability to understand human activity over and above the insights to be derived from still imagery.

"Fifty percent of human intelligence involves the observation of activity," said Jane Bernat, director of integrated solutions at Overwatch Systems, a unit of Textron Inc. "If we wanted to take down an enemy compound, for example, a day of video surveillance will provide the understanding we need that would take a lot longer through other means. This represents a whole new way of doing business."

As the functional manager for intelligence imagery, including video imagery, NGA plays an important role in the storage, standardization, analysis and dissemination of video data. "We are responsible for setting standards for processing and formatting this type of data," said Smith.

The key data standard is the Motion Imagery Standards Profile, which outlines how data is to be formatted and handled and what metadata is to be included with it. Metadata is key to searching for relevant video data in a database, as well as synchronizing video data with other forms of intelligence data.

NGA also partners with the services and defense agencies that collect, analyze and disseminate video intelligence. "We don't own or operate any of the FMV collectors," said Smith. "We partner with the armed services and other government agencies to integrate video into the National System for Geospatial Intelligence."

NGA is a partner in the ground segments of intelligence collections systems like the Distributed Common Ground System (DCGS) that are fed by assets like Predator and Shadow.

NGA is also active in the Defense Intelligence Information Enterprise. "This is a new and growing capability that allows us to link together the information technology architectures of the military services and intelligence communities so that we can share information and move information back and forth," said Smith. "In many cases we can also share computational and storage resources. NGA is a lead in both of those efforts, especially for motion imagery."

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Video Architecture

The tools used by NGA analysts are rudimentary, according to Smith, allowing analysts to play the video backwards and forwards and to add metadata tags. A flurry of home-grown and incompatible analysis tools around the military and intelligence communities led NGA to develop the National System for Geospatial Intelligence Objective Video Architecture (NOVA), which will be rolled out in the next few months.

NOVA will allow analysts located at diverse locations who are working on the same video stream to share their annotations and their tagging of objects and events, and to do so in a standardized way. "That way, someone who looks at the product sometime later can receive the benefit of those who looked at it earlier," said Smith.

NOVA combines the geospatial information systems that NGA already provides with commercial broadcast capabilities. "It is similar to the system a television producer covering a football game or a news story has in the production van," said Smith. "It allows you to rapidly search large volumes of motion imagery and video based on a specific context. We're applying those same principles to Predator video. We have also made some improvements to the storage of the massive volumes of video data."

Lockheed Martin, which is one of the two leads, along with Harris, on NOVA, is in the process of delivering similar capabilities to the Afghanistan theater under the auspices of Joint Forces Command. Developed by Lockheed, Harris and NetApp under a $29 million contract, several nodes of the Valiant Angel system were deployed to Afghanistan earlier in 2010. The system is designed to take control of the flood of video being generated by using broadcast television technology to help commanders collect, archive, search, analyze and share full motion video.

The Valiant Angel system incorporates tools and technologies from Lockheed Martin's Audacity video analysis system, Harris' Full-Motion Video Asset Management System (FAME), and NetApp's Data ONTAP high-performance storage technology.

Each Valiant Angel node consists of a suite of high-capacity servers that store and archive video footage from multiple sensors and UAVs, together with a software system that allows users to catalog, tag, search and analyze video clips. "Users can search the archive for a specific person or vehicle, or they can fuse mapping, geospatial and multi-source intelligence data with video feeds to conduct in-depth analysis," said Armstrong. Valiant Angel works with both archived video and with live, incoming video streams.

Tagging people and objects found in video feeds enables users to search the system for otherwise hard-to-find footage. "For example, a red truck in front a building may be of interest," said Armstrong. "The system allows users to query the system for the last time within 30 days the same vehicle was located at the same location."

From an analysis and exploitation standpoint, full-motion video does not exist in a vacuum. FMV is another geospatial data type that is to be integrated with other data to provide richer and more useful intelligence products. The integration of multi-source intelligence represents a major theme in the enhancements being introduced to exploitation kits.

"The more appropriate analysis of video isn't restricted to video on its own," said Rob Mott, vice president for military and intelligence solutions at Intergraph. "It needs to be done integrated manner."

"The addition of different types of information such as human intelligence and signal intelligence provides a richer situational concept of what the warfighter can expect to see and experience when entering an area," said Mark Wolsky, director of marketing at Overwatch.

Georeferenced Intelligence

Key to performing analysis with the Valiant Angel system is the capability to overlay other georeferenced intelligence onto the video. "The overlays can be from any georeferenced source," said Armstrong. "They are limited only by the imagination."

Recent enhancements to Intergraph's geospatial exploitation tool kit include capabilities to fuse full motion video, geospatial elevation data and satellite imagery into a single view. The tool allows analysts to overlay street names on video images to help "get the video oriented to

the surrounding area," said Mott. "Analysts can also compare archive video with real-time video to do change detection which is a more advanced type of analysis. Through the integration of all that data you can create a combined analytical environment."

SAIC recently launched its Advanced Intelligence Multimedia Exploitation Suite (AIMES), a motion imagery exploitation system that enables intelligence analysts to fuse, exploit and report on motion imagery data. AIMES builds on SAIC's existing Video Processing Capability line of products to include new advanced analytic functions.

AIMES is built on an open architecture that enables the rapid integration of third-party tools, algorithms and services. "This enables the retention of a consistent FMV infrastructure, while keeping pace with the new technologies," said Keller. AIMES is compatible with DCGS services to enable the integration of all-source spatial and geospatial information

"AIMES enables near real-time and forensic fusion of full motion video, all-source intelligence information, as well as synchronized visualization of raw data, chat and processed intelligence," said Keller.

Overwatch combines a number of its different products to provide warfighters with FMV intelligence in near real-time. The company's Tactical Remote Exploitation (T-REx) product, packaged in a ruggedized tablet computer or a small workstation, enables all-source intelligence analysis from an array of sources.

"T-REx enables analysts to review video and identify an area of interest and then realize multi-source forensic data based on the georeferenced coordinates," Wolsky said. The analyst can then transmit intelligence products—such as three-dimensional renderings, or short video clips—to warfighters over handheld devices.

As FMV assumes ever-greater importance among intelligence analysts, collaboration tools that streamline the process of sharing and discussing video become increasingly important. A solution being developed by Merlin International includes a tool from a company called cut2it that allows users to share, engage with and collaborate within a video.

"What we have found in the ISR market is that users don't want create multiple copies of the same video," said J.P. Morgenthal, Merlin International's chief architect. "With this tool, analysts identify the critical portion of a video and send a link to their colleagues to discuss and add knowledge to that particular clip.'

Merlin's solution also includes real-time image processing software for FMV from MotionDSP that enhances the images viewed by analysts. The video feeds transmitted by UAVs can suffer from a number of deficiencies deriving from the shakiness of the platform, the standard resolution of its sensor and the dust and haze that are often present.

"Algorithms analyze how the neighboring frames in your clip are related to one another in a process called motion estimation," said Sean Varah, chief executive officer of MotionDSP. "We recover the best available image information from multiple frames and reconstruct each frame of video with this information to enhance the appearance and quality of the video."

Intergraph has also incorporated video enhancement and stabilization into its exploitation kit. "Video shot over the desert form a Predator following a convoy, for example, will usually include distortion due to heat haze," said Mott. "This capability stabilizes, enhances and brightens the raw video and displays it in the analytical environment."

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Storage and Automation

For all of the progress that has been so far in the analysis and exploitation of FMV, the intelligence community and its vendors have further challenges to overcome. One involves the storage of the staggering volumes of video data intake.

"It is a tremendous issue from a policy perspective," said Morrison. "How long must it be stored before it is discarded? Some users may want the data to be stored for a certain number of days and thrown out. Other may want to prioritize certain packages of data over others based on different criteria such as how often it is accessed. They need tools in order to be able to do this."

"One thing that we have to get better at is understanding how to capture and retain the contextual data that goes along with the video. This becomes important when you are thinking about forensics. Data on why this video data was collected, who collected it, what was going on at the time, and what the results were are not associated with the video archives in place today. We have the ability to capture some of this data on our T-REx and Shadow platforms. Now we need to figure how to that make this information available to the community as a whole," said Bernat.

Another capability that is on the drawing boards is the automation of some of the analytics processes. "Instead of having individuals staring nonstop at video, what is needed is more automated initial processing of video using different technologies such as pattern recognition and change detection," said Armstrong. "We also need some additional indicators and alerts so that we can focus the attention of the human operator where there is higher probability of it being needed and where it can generate an actual outcome."

Armstrong also expects that some of the video processing will be done onboard the platforms and sensors so that the data does not have to be downloaded and processed. "It's a good idea to move some of these pattern recognition and change detection algorithms to the platform, and then transmit only those portions of the video deemed necessary off the platform," he said.

Eventually, the quality of enhanced video will also be improved and there will be an ability to automatically classify objects seen by the camera. "We need to make software so that the sensor sees the way the human eye sees," said Varah. "You can drive in a bouncy pickup truck and still see people and objects around you. The human brain has the capability of ignoring the shaking of the head and still be able to understand your surroundings." ★

Contact Editor Harrison Donnelly at harrisond@kmimediagroup.com.
For more information related to this subject, search our archives at www.GIF-kmi.com.

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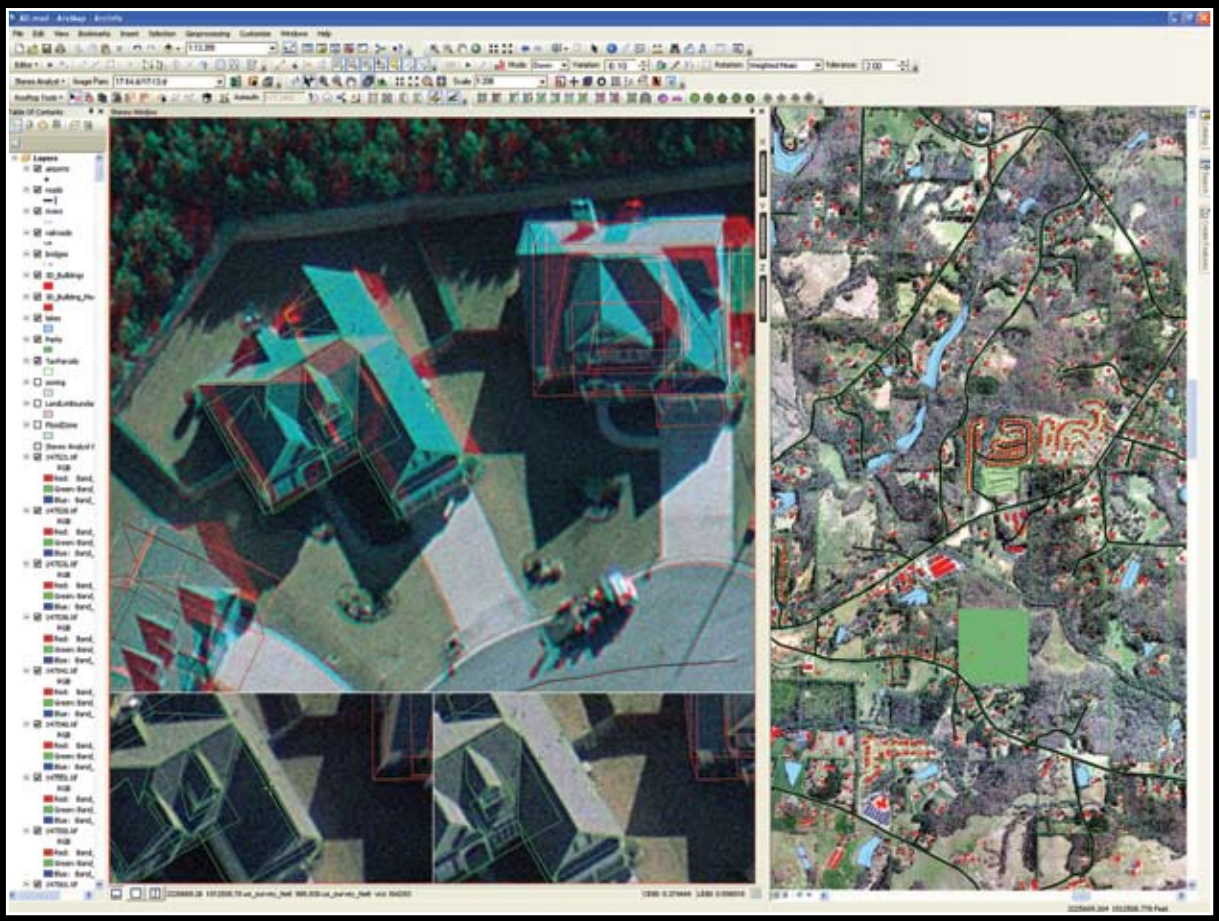

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USGIF from the Desk of the President

Keith J. Masback, President USGIF

During the week of November 1 more than 4,000 total attendees, who included representatives of 220 exhibitors and sponsors, came to New Orleans to participate in the GEOINT 2010 Symposium.

The amazing turnout made this year's event the largest GEOINT Symposium to date. Our previous attendance record, set last year, was slightly more than 3,200 total attendees. This attendance, combined with keynotes from the most senior officials in the intelligence community, a diverse multi-INT agenda and a fantastic exhibit hall, made this year's symposium, by all anecdotal accounts, the best yet.

I mention the "multi-INT" agenda specifically because as USGIF and our flagship annual event have grown, it has become increasingly important to frame our discussions in this larger context. Our speakers and panel topics now represent a broad cross-section of the defense, intelligence and homeland security communities. The GEOINT Symposium is absolutely the largest annual gathering of intelligence professionals in the nation—and perhaps the world.

As our agenda has over the years become more inclusive, our audience and exhibitors have also come to be more diverse. This year we reached out to the defense intelligence leadership in order to integrate end-to-end ISR into our program. We devoted an entire day to DI2E, the Defense Intelligence Information Enterprise. This was just one example of how USGIF accomplishes its mission of fostering conversation and helping to build the community.

However, this broadening wasn't limited to a single afternoon or even a single day of the GEOINT Symposium agenda. Our keynote speakers of course included NGA and NRO, but also leaders from DHS, DIA, NSA, ODNI, OUSDI and the Joint Chiefs of Staff.

I think some consistent themes emerged from our keynote speakers: that intelligence integration and information sharing are critical; that old acquisition processes are no longer adequate; that commercial best practices are key to our way forward; and that intelligence consumers need to be smart, empowered users with immediate access to data, information and knowledge at the point of decision.

The daily breakout sessions also covered a multitude of topics, including maritime domain awareness, open source intelligence, NSG functional management, interoperability and standards, emerging sensors and platforms; multi-INT integration, information sharing, human terrain, and the cyber-location nexus.

Our exhibit hall was filled with varied offerings from vendors that cut across hardware, software, services, data and information, communications and processing, and myriad other opportunities.

End-users were also heavily represented via the U.S. Air Force's Eagle Vision, U.S. Army North, U.S. Army South and the Army Geospatial Center, among others. I was particularly pleased that the Stryker vehicle was positioned right in the middle of our lunch area as a not-so-small reminder of one of the reasons we do what we do—to support our men and women who are in harm's way.

If you missed any of the keynote addresses or breakout sessions, if you didn't get around to as much of the exhibit hall as you wanted, if you wanted to see the award presentations, or if you'd like to watch recaps of other activities from GEOINT 2010, we have a great deal of coverage on our newest website, www.geointv.com. This site is a great way to see content you might have missed or to share presentations and discussions you found to be particularly valuable. We couldn't be more pleased to offer a state-of-the-art way to serve up our rich and varied digital video content, and we hope you agree.

Of course, we truly couldn't accomplish all that we do without our USGIF members, sponsors and hard-working volunteers. I've said it before, and I'll say it again, but thank you.

The volunteers help make all that we do possible, and USGIF is always looking for new volunteers to expand our corps. The planning for GEOINT 2011 is already under way, so please contact us now if you would like to help out or suggest a topic for next year's symposium. Many of the GEOINT 2010 breakout sessions were conceived in the months immediately following GEOINT 2009, and the same will hold true for GEOINT 2011. Next year's symposium will be upon us before we know it. We are heading back to San Antonio, Texas, October 16-19, for GEOINT 2011.

As you know, the GEOINT Symposium is just one of the programs USGIF annually produces. Our USGIF Workshop Series will be gearing up again soon, as will the next GEOINT 101 class. Our academic director, Dr. Max Baber, is working on some new academic and educational initiatives that we'll be announcing early next year. We are happy to be working with NGA to once again offer the NGA West Showcase in April 2011.

We are also truly excited about our ongoing engagement with the U.S. Army, and the Army Geospatial and Imagery Conference will remain an integral part of GEOINT Community Week. GCW takes place in May 2011, and like last year, AGIC will take place the same week. The Army Geospatial Center, the office of the G-2 and the Army Corps of Engineers are strong supporters of AGIC, and we look forward to working with them again and seeing all of you at AGIC and GEOINT Community Week.

Best wishes for a safe and happy holiday season, and we look forward to another successful and exciting year for USGIF, our members and our partners.

Sincerely,

Keith J. Masback
President

The United States Geospatial Intelligence Foundation (USGIF) is the only organization dedicated to promoting the geospatial intelligence tradecraft and building a stronger community of interest across industry, academia, government, professional organizations and individual stakeholders. To become a member or learn more about USGIF, please email info@usgif.org or call us at 1-888-MY-USGIF.

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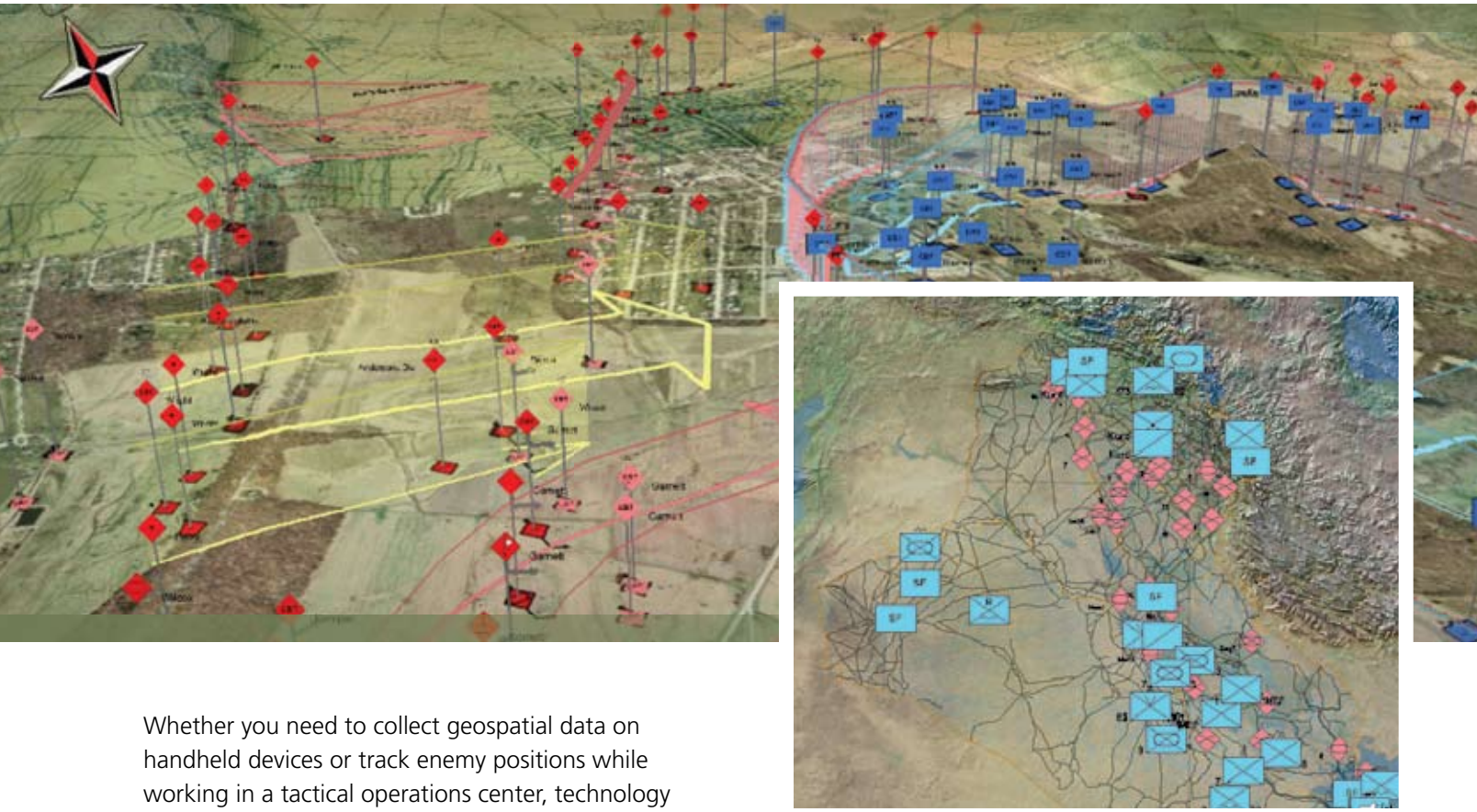

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Read how geospatial technology from Esri, like the software in the Commercial Joint Mapping Toolkit (CJMTK), was used to build battlespace visualization and decision support tools. Visit **www.esri.com/c4isr**.

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YPG Service Project Maps New Orleans 7th Ward

As part of its GEOINT 2010 Symposium program, the USGIF Young Professionals Group (YPG) hosted a service project on November 1. The YPG worked with Beacon of Hope Resource Center to survey and map the condition of the Filmore Gardens neighborhood in the 7th Ward of New Orleans. The group also coordinated with Hewlett-Packard to donate a new HP Designjet T7700HDV plotter to Beacon of Hope.

Forty volunteers, who included the USGIF YPG and GEOINT 2010 attendees from industry and government, all gave a few hours of their time to learn about the community and give back a little more in a fitting way for the GEOINT community. Teams of two or more people using a spreadsheet and neighborhood map marked the conditions of property and other infrastructure. Neighborhood residents assisted with the project and informed the group about Filmore Gardens, discussing the damage sustained during Hurricane Katrina and the current recovery.

Beacon of Hope collects this data and then produces detailed maps for the residents to use to identify blight, update occupancy rates and request state and local funding.

During the week of GEOINT 2010, the YPG also was treated to a behind-the-scenes tour of the exhibit hall with USGIF President Keith J. Masback and a special lunch with USGIF CEO and Chairman Stu Shea, Masback and other members of the board of directors. Those interested in joining USGIF's YPG are encouraged to e-mail to ypg@usgif.org.

Foundation Recognizes USGIF Award Winners on Stage at GEOINT 2010

USGIF President Keith J. Masback and USGIF Awards Subcommittee Chair Kevin Jackson, assistant vice president of business development at SAIC, presented the 2010 USGIF Geospatial Intelligence Achievement Awards on Wednesday, November 3.

This year's recipients are Ms. Donna Bridges, Penn State University (Academic Achievement Award); Dr. Dennis J. Bellafiore, senior lecturer, Department of Geography, John A. Dutton e-Education Institute, Penn State University (Academic Research Award); Department of Homeland Security U.S. Customs and Border Protection Enterprise GIS team (Geospatial Intelligence Achievement Award-Government); U.S. Central Command Human Terrain Analysis Branch (Geospatial Intelligence Achievement Award-Military); and Mr. Steve Panzer and Mr. David Hemphill of ObjectFX (Geospatial Intelligence Achievement Award-Industry).

The USGIF Awards Program annually recognizes the exceptional work of the geospatial intelligence tradecraft's brightest minds. The Intelligence Achievement Awards recognize outstanding accomplishments in the tradecraft by an individual or team from military, government and industry. The Academic Achievement Award commends the achievements of a top graduate of a nationally recognized geospatial intelligence academic program. The Academic Research Award commends an organization that demonstrates the top geospatial intelligence program or project.

Recipients are acknowledged on stage during the general session of the GEOINT Symposium. Highlights of the awards presentations can be watched online at http://geointv.com.

GEOINT 2010 Total Attendance Surpasses 4,000

USGIF's GEOINT Symposium again broke previous year records in attendance and exhibits. More than 4,000 total attendees walked through the doors of the New Orleans Ernest N. Morial Convention Center for GEOINT 2010.

USGIF last year revamped the way it accounted for and reported final attendee numbers to provide our membership and exhibitors a clearer picture of who actually came to the symposium. Last year this number was just over 3,200, and we were excited to see that the number exceeded 4,000 during GEOINT 2010.

But the record attendance was not just due to the great lineup of keynotes from agency directors, panel discussions and more breakout sessions. GEOINT 2010 also featured its largest exhibit hall ever, with expanded academic and new member pavilions. Over 100,000 square feet of space featured 220 exhibitor and sponsor organizations, an increase from almost 175 last year. The technologies and solutions on the exhibit floor drew the interest of many of the keynote speakers who scheduled dedicated time on the show floor. More about GEOINT 2010 is available at http://geoint2010.com.

Jack Dangermond Receives the Arthur C. Lundahl Award

USGIF has announced Mr. Jack Dangermond, president of Esri, as the 2010 recipient of the newly renamed Arthur C. Lundahl Award. Dangermond was presented the award during a general session on November 4, the final morning of GEOINT 2010.

To fully honor the foundation's lifetime achievement awardees, USGIF this year changed the name of its USGIF Lifetime Achievement Award to the Arthur C. Lundahl Award. Though the purpose of the award remains the same, the foundation wanted to recognize its honorees with a name that would immediately be understandable and elicit the emotion and importance of such an award.

Arthur C. "Art" Lundahl is recognized as the father of imagery analysis. He dedicated his life to the tradecraft, enabling him to gain the confidence of four U.S. presidents and significantly contribute to the GEOINT tradecraft and security of the United States.

The entire award presentation and acceptance speech can be watched online at http://geointv.com/.

Save the Date: GEOINT 2011 Returns to San Antonio

In about 10 months, you could be down by the San Antonio River Walk for the GEOINT 2011 Symposium. The symposium returns October 16-19, 2011, to a city and a venue that our attendees consistently rate in survey feedback as a favorite venue. We hope you'll join us at the Henry B. Gonzalez Convention Center in downtown San Antonio for GEOINT 2011. Check geoint2011.com for updates.

GEOINT Power in Your Hands

NGA DIRECTOR CALLS FOR PROVIDING ON-DEMAND ACCESS AND BROADENING AND DEEPENING OUR ANALYTIC EXPERTISE.

(Editor's Note: Following is an edited version of remarks by NGA Director Letitia A. Long at the GEOINT 2010 Symposium, on November 2, 2010.)

I was appointed director of the National Geospatial-Intelligence Agency almost three months ago, and I can give you my bottom line now: This is a great agency with a tremendous mission. There is a breadth and depth here that I appreciate more every day, and I think, there is significant, unrealized potential. I am extremely fortunate to have assumed leadership of NGA at this ideal time. NGA has earned its place at the table. We have arrived.

Why do I say this? Because no one will go to war without us, no one will manage a humanitarian crisis without us, and no one will respond to a natural disaster without us.

NGA is always ready to support our customers. Our work force is highly educated, motivated and ready for what's next. I see that every day, and it is one of the most rewarding aspects of my job.

NGA has delivered on former NGA Director and Director of National Intelligence Jim Clapper's promise of providing situational awareness. We provide that common operating picture, and as he said earlier this morning, it is the solid foundation upon which all intelligence is built. We owe a debt of gratitude to him. Thanks to Admiral Bob Murrett, in the last few years NGA has stepped up its support to military operations, discovering and applying innovative ways to support the warfighters as an integral part of their decision cycle.

We did not and could not have done this alone. You, our industry partners, are also an integral part of why NGA, the National System for Geospatial Intelligence (NSG) and the global GEOINT community have achieved the successes we have, and you are a critical part of our future. And I thank you.

As we look to our 15th anniversary next October, NGA is ready to take GEOINT to the next level and put the power of GEOINT in your hands. I'd say this is our version of GEOINT 3.0. I see two principal near-term goals in order to do this.

First: Provide online, on-demand access to our GEOINT knowledge. Give our customers, from novice to expert, access to our content, our services, our expertise and to our support—and to tools that allow them to serve themselves.

Second: Create new value by broadening and deepening our analytic expertise. By providing deeper, contextual analysis of places informed not only by the earth's physical features and imagery intelligence, but also by "human geography."

On-Demand Access

Let me take a moment and show you what I mean. We first have to put the power of GEOINT directly in the hands of our users through online, on-demand access to NGA's knowledge. I want to fundamentally change the user's experience.

Here's where we are today. At any given time, we typically know where all of the "hot spots" are around the world. We know what is happening. We know what geospatial intelligence support is needed. And we know what support we are providing. We are filling gaps in collection by directing a wide range of assets. We are producing tailored products, often by NGA employees forward-deployed with the customer.

In Haiti, for example, NGA produced products that showed the locations of airfields as a function of distance from the earthquake's epicenter so aid could be delivered. We produced products using LiDAR to create an initial damage assessment.

And we produced detailed graphics that highlighted the level of damage, and the locations of functioning hospitals, internally displaced persons camps, and the viability of the transportation network between them.

These products were readily available on the World Wide Web as well as through our own GEOINT Online site—to increase the information sharing potential for an expanding user base.

While this support was superb, I will tell you that it was labor-intensive, and that making and sharing some of these discrete products online was done through "brute force." Once produced, the products themselves were static, and updating them was more of a manual than an automatic process. Users had to rely upon NGA to do the work.

What do I see next? I want to take what NGA has done for the user and put that power directly in their hands—on a mobile device or the means of their choosing. And I want to fundamentally change their online experience to one where they can interact with dynamic content and services themselves, if and when they want, through online, on-demand access to global seamless foundation, imagery, product and activity layers.

I think you all know what I'm talking about: In 1994, Amazon.com changed the way we find and buy books. Commercial companies have changed the way we interact with each other online and with mobile devices, tablets and a plethora of apps, many with location-based services. NGA has not taken full advantage of these technologies and trends and incorporated both what's possible and increasingly commonplace today in how we deliver what we have and what we know.

We have to take the complex geo-processing capabilities of GIS and deliver to the user intuitive but powerful apps that perform the tasks that are needed. Would you like to determine potential helicopter landing zones? We'll build you an app for that. Do you want to determine distribution routing? We'll build you an app for that also. Do you want to geo-tag photos? Well, let's create an app for that, too—and many more that allow you to access open source street maps, or apply crowd sourcing to solve a problem.

I'd like to see transparent access to as much raw data as possible, including open source data. I'd like to see a proliferation of apps, developed by both providers and users, that empower users to "do it themselves," when and where they want. I'd like to see innovative use of social networking behavior and technology to enhance and easily share what we know on a continual basis. In other words, I'd like to see our users empowered, and give them a much better experience as part of a suite of online services.

We can empower our users to "serve themselves" online like we all do in our private lives when we use e-commerce sites. We need to give them applications that will allow them to work with our data, information and knowledge, just like mobile phone users are empowered with their apps and online stores and marketplaces.

We need to provide the means to easily discover and retrieve our GEOINT products and services, to interact with our dynamic layered content, and to be able to obtain or request new products, new analysis and new services, as well as to provide the means for users to contribute their work and analyses for everyone's benefit in the global GEOINT community.

Having a responsive online, self-serve capability—our storefront, if you will—will allow us to focus our attention on two other ways of interacting with our users: assisted service and full service. I think we can improve upon the support we now provide to our deployed warfighters in whatever environment they face. We need to provide our partners with capabilities to "find an expert" to answer their questions, collaborate on a product or request more service.

Of course, we will continue to deploy our people and embed them with our mission partners. Yet those forward-deployed GEOINT experts will now have much better online access and tools, so their value to the warfighter will be even greater. We need our analysts, wherever they are, to be doing analysis—not searching to find existing products.

There are many ways you can help us achieve this first goal of creating online, on-demand access to GEOINT knowledge. For example, how do we:

- Improve the ability to discover our products;
- Empower developers to create apps that give the end-user the power that they need;
- Move toward a seamless coverage model and away from discrete products; and
- Make this content accessible globally.

If we are to operate as an online, on-demand GEOINT knowledge service, then we need to alter the way we think about our data, and about our analysis, and about how we deliver our knowledge so that it can be accessed in a timely, customized and responsive manner.

Deeper Analysis

Now, let's talk about the second goal: creating new value by broadening and deepening our analytic expertise. GEOINT is not only about describing where, what, when or how many, although we're very good at that.

It's also about possibilities, trends and implications. It's about context. It's about anticipating what could happen, where it could happen, and why it could happen.

By moving to more of an anticipatory posture, we can create new value for the policymakers, warfighters, intelligence community and first responders. The potential value added is significant: If we can use our GEOINT expertise to focus the national security community on an issue before it becomes a crisis, we will have given everyone the opportunity to leverage their assets more effectively, and we will have given the policymaker valuable time to consider a broader range of policy options.

But what does this really mean? GEOINT by its very nature is synonymous with a deep contextual understanding of places—of locations on the Earth. This understanding is informed by what we know about the Earth's physical features. It is informed by what structures people build. It is informed by how people use those structures—their activities, if you will. And it is informed by human geography. It is data and information that can be understood spatially and depicted visually that further deepens and enriches our understanding of a place.

Human geography includes things like tribal boundaries, political ideology, birth and death rates, populous places, proximity to health facilities, principal market commodities, ethnicity, languages, education, access to media and other cultural features.

Unlike terrain or man-made features, this data set can and does change rapidly and dramatically based on the problem. GEOINT is the examination of all of this data viewed through a spatial and temporal lens. This is what makes it GEOINT, and this is what makes NGA—and the kind of people we employ—uniquely postured to analyze this data and convert it to information and knowledge.

What we need to do is exploit the spatial and temporal properties of this data, to discover patterns, trends, signatures and correlations in that data, and to communicate this GEOINT analysis visually. Often, the human mind cannot absorb vast amounts of data through the written word alone. NGA "thinks spatially" and can depict that visually. This is a unique, core competency that we bring to the national security mission.

The integration and analysis of all of the data that we can obtain about a place can yield new insight into age-old questions:

- Where are the conditions right for WMD proliferation?
- Where will the next pandemic outbreak occur?
- Where will transnational criminal activity spread?
- Where will the next mass migration event occur?
- Where are the populations most susceptible to extremist ideology?

If we were to look at one of these questions from the perspective of GEOINT, here's what we might examine.

We would look at a broad range of geospatial information—the type of terrain, elevation, and feature data like roads, buildings, hilltops and rivers. And we would ask how do people move from one place to the next? How does this manifest spatially and over time?

We would look at populations: language, ethnicity, education, demographics. Do certain populations commonly or readily form alliances? How does this manifest spatially and over time?

We would look at history: Is there a history of religious conflict in a region? How does this manifest spatially and over time?

We would also look at the economy, access to technology, and climate, and how these manifest spatially and over time.

My purpose today is not to answer these enduring national security questions. My purpose is to suggest that our analysis will be greatly enriched by the understanding the interrelationship of all GEOINT factors—the Earth's physical features, imagery intelligence, and human geography.

NGA's Unique Value

The unique value that NGA brings is our ability to look at a huge amount of information through a spatial and temporal lens, in an interrelated way. The resulting analysis will yield new analytic insights and give the national security community a deeper context to grapple with these difficult questions. For example:

- Spatial data analysis techniques can create signatures for activity and phenomena that help us locate places with similar characteristics that relate to the hard problems we face. In other words, we can "narrow our search space" and provide the basis for our customers to use their resources more efficiently and more effectively.
- Such anticipatory analysis can also help us understand the context for interpreting activities—What's normal? What's not normal?
- Spatial representations of a variety of data help reveal patterns not evident in textual data.

As long as we have the courage to "let the data surprise us," I am convinced our analysts will lead to new discoveries—and not only by NGA. We will enrich the analysis of others, especially the analysis performed by the all source analyst. And that's the power of GEOINT.

There are many ways you can help us. How do we deal with:

- Vast amounts of unstructured data?
- Untagged data?
- Pattern recognition in large data sets?
- Visual analytics, including four-dimensional visualization capabilities?
- Behavioral modeling?

I could go on, as I know you all could, too. But let me leave you where I began: I want to put the power of GEOINT in your hands. First, through the creation of online, on-demand access to our knowledge; and second, by providing deeper, contextual analysis of places informed not only by the Earth's physical features and imagery intelligence, but also by human geography, so we can better anticipate when something may happen and why.

We cannot do this without you, our industry partners, government partners, and international and academic partners. And we cannot do this without a deep and continuous interaction with our users—those policymakers, warfighters, first-line responders and relief organizations, for they are our motivation to excel. ✭

Contact Editor Harrison Donnelly at harrisond@kmimediagroup.com. For more information related to this subject, search our archives at www.GIF-kmi.com.

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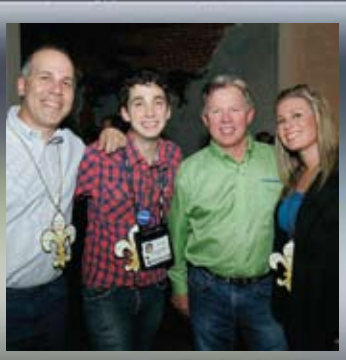


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Enhancements Display Validity, Accuracy of Geographic Coordinates

Overwatch, an operating unit of Textron Systems, a Textron Inc. company, has announced the release of its latest satellite image analysis software, RemoteView 3.2. RemoteView is a leading imagery intelligence product for the defense and intelligence community and is noted for its ease of use, accuracy and innovative workflow. The most significant enhancements made to RemoteView 3.2 can be found in the new Geo-Confidence and Elevation Coverage Indicators. These tools work together to provide analysts with an instant color-coded display and description of the validity and accuracy of geographic coordinates, along with information on how much of their image is covered by valid elevation data. The new features, coupled with RemoteView's existing integration with precision positioning and mensuration packages, reinforce RemoteView's position in the geospatial analysis market. The new version of RemoteView also includes the ability to visualize and utilize light detection and ranging (LiDAR) point cloud data. This allows analysts to leverage the high resolution elevation information that LiDAR offers and visualize point clouds that contain hundreds of millions of points. Additional RemoteView 3.2 enhancements include custom sorting of folder contents by specific criteria, bookmarking view settings for particular scenes and magnification without obscuring the original target area. It also offers support for the Web Coverage Service, publishing to Google Earth and portable document file, and visualizing the severity of slope to conduct mobility analysis. The improved 3D Pro extension expands RemoteView's 3-D visualization and analysis tools, providing warfighters and decision makers with realistic mission insight.

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Production Suite Offers Stereo Feature Collection Capabilities

ERDAS announces a new release of ERDAS Extensions for ArcGIS, a production suite of tools that enhance the ArcGIS 10 platform with ERDAS' image processing and stereo feature collection capabilities. ERDAS Extensions for ArcGIS 10 consists of Image Analysis for ArcGIS, Stereo Analyst for ArcGIS, and two optional modules that extend Stereo Analyst functionality, ERDAS Terrain Editor for ArcGIS and FeatureAssist for ArcGIS. Image Analysis is a solution for preparing, referencing, measuring and analyzing imagery from airborne and satellite sensors. Fully integrated with ArcGIS, it enables users to extract up-to-date information from imagery directly into a geodatabase, dramatically increasing accuracy and productivity. Stereo Analyst enhances the ArcGIS 10 workspace with stereo support, enabling users to view and edit in 3-D, utilizing standard editing tools to maximize productivity. Terrain Editor handles stereo edits to Geodatabase terrain files. It provides a complete set of point, breakline and area tools, including a tool for autocorrelating new points to participate in the terrain. FeatureAssist enables the collection of roof structures as Esri Multipatch shapefiles, allowing 3-D models to be constructed for realistic scene generation.

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Storage Management System Solves GEOINT Data Issues

Hie Electronics has introduced the TeraStack Solution to the geospatial intelligence community. The TeraStack Solution offers an energy-efficient hierarchical storage management system comprised of an enterprise application server integrated with 78TB of online and nearline storage, and unlimited offline data storage, in a compact 15U unit. Consuming only 600 watts of power, this "green" solution does not require special cooling or a raised-floor data center environment. The TeraStack Solution provides a turnkey system that can help solve many of the issues associated with the retention and management of critical GEOINT data.

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Release Streamlines Addition of Geospatial Image Analysis

ITT Visual Information Solutions, a developer of software products for data visualization and image analysis, has announced release of ENVI 4.8, the latest version of its premier software solution for extracting information from geospatial imagery. This release significantly streamlines the process of adding image analysis to the workflows of image analysts, researchers and GIS professionals across industries, allowing users to take advantage of the important information imagery provides. ENVI 4.8 delivers complete integration with the ArcGIS platform from Esri, now making image analysis tools accessible directly from within the ArcGIS interface. In addition, ENVI now includes the capability to incorporate LiDAR data with other geospatial products, as well as a new, automated process for viewshed analysis, helping to create situational awareness from fixed vantage points. Releasing concurrently with ENVI 4.8, ITT also announced ENVI for ArcGIS Server, which delivers ENVI image analysis tools to users across entire organizations using ArcGIS Server. ENVI 4.8 completes the third phase of ITT's integration effort with ArcGIS from Esri, making it easier than ever to update a GIS with valuable information from geospatial imagery. This ENVI release allows ArcGIS users in both desktop and server environments to access ENVI image analysis tools from a familiar ArcGIS toolbox.

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Rugged Handheld Unit Offers Enhanced GPS Performance

Trimble has introduced the next generation of the Trimble Nomad outdoor rugged handheld computers. The Nomad 900 series adds a 5MP autofocus camera with flash, enhanced GPS performance and new Wi-Fi capabilities. These new features, along with its rugged construction and computing power, make the Trimble Nomad 900 series ideal for mobile workers. Powered by an ultra-fast 806 MHz processor and Trimble's optimized graphics processing, advanced caching and proprietary high-speed journaling file system, the Trimble Nomad 900 series handhelds are some of the fastest Windows Mobile computers on the market today. The 900 series offers top-of-the-line performance with a 5200 mAh rechargeable lithium ion battery, up to 6 GB of Flash memory and a sunlight visible VGA touch screen display. The Trimble Nomad 900 series meets MIL-STD-810F standard for drops, vibration and temperature extremes and comes with an IP67 rating. In addition, users can take advantage of the Trimble Nomad 900 series CompactFlash and Secure Digital slots to add more devices, such as SD/SDHC memory and RFID. Tuned to maximize the integrated GPS receiver's performance, the Trimble Nomad 900 series handheld has an enhanced antenna design that provides a rapid time-to-first fix to improve GPS productivity in difficult GPS conditions. The handhelds ship with the Windows Mobile 6.1 operating system, featuring a redesigned user interface, enhanced security, simpler e-mail and Bluetooth setup and more.

GPS Advanced Control Segment Clears Design Review

A Raytheon-led team has successfully completed a key design review of the Global Positioning System (GPS) Advanced Control Segment (OCX), signaling the team's readiness to proceed with the next development phase of the program. Nearly 70 representatives from the government, aerospace and System Engineering and Integration, a contractor for the GPS Wing, recently completed a three-day software specification review at Raytheon's Intelligence and Information Systems facility in Aurora, Colo. During the review, the team detailed its architecture and software requirements for GPS OCX, which will deliver the advanced control segment designed to provide secure, accurate and reliable navigation and timing information to military, commercial and civil users. Raytheon is the prime contractor for the $886 million program. The software specification review is the culmination of several analyses: the architecture; operations concept; segment, prime mission and interface requirements; and allocation to the software requirements specifications, interface requirements specifications and operational concept document.

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Portfolio Expanded to Include Geospatial Analytics Services

Deloitte has expanded its portfolio of financial and data analytics offerings to include new capabilities in geospatial analytics services. Deloitte's new service offering will be led by Matthew Gentile, former chief executive officer of Traverse Technologies, a geospatial analytics firm. Gentile joined the organization as a principal in the federal analytic and forensic technology group within the forensic and dispute services practice of Deloitte Financial Advisory Services LLP. Gentile and the entire geospatial analytics team from Traverse, who have also joined Deloitte, will help identify and address performance challenges where geospatial analytics can help federal agencies whose missions demand the collaborative exchange, display and analysis of geospatial data. The role of geospatial data and technology is growing throughout numerous aspects of government. Homeland security, defense, intelligence, energy, health care, transportation, law enforcement, telecommunications, immigration and natural resource management are all elements of the federal landscape that increasingly rely on geospatial analytics and visualization to address complex challenges. For example, federal agencies can rely on geospatial analytics to help track and manage physical assets, better understand the flow of money that supports terrorist financing, map the disbursement of funds for government assistance programs, and plan and prioritize recovery efforts for a natural disaster.

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Application Migrated to Virtualized Data-Center Environment

BAE Systems recently migrated a server-based mission application into a virtualized data-center environment to increase reliability and reduce operating costs, completing the first task order under the National Geospatial-Intelligence Agency's Total Application Services for Enterprise Requirements (TASER) contract. Under TASER, NGA will similarly transition other legacy hardware and software systems to an application and infrastructure service provider business model over the next five years, as part of a $1 billion indefinite delivery/indefinite quantity contract in which BAE Systems will compete for task orders. TASER is the primary vehicle for evaluating, integrating and sustaining new applications across the National System for Geospatial-Intelligence, which combines technology, policies, capabilities and the communities necessary to produce geospatial intelligence. Earlier this year, BAE Systems was one of only four contractors awarded all four functional categories of the contract including engineering and trade studies; pilots and prototypes; integration and deployment; and application sustainment. BAE Systems is transforming the geospatial-intelligence tradecraft through the development of innovative geospatial and analytic solutions that support critical national security missions. The company provides expertise in geospatial analysis, processing, exploitation, emerging sensors, training and touch-screen geospatial modeling.

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GEOINT Engineer

Q&A

Providing the Soldier with the Best Situational Awareness

Lieutenant General Robert L. Van Antwerp Jr. Chief of Engineers, U.S. Army Commanding General, Army Corps of Engineers

On May 18, 2007, Lieutenant General Robert L. "Van" Van Antwerp became the U.S. Army chief of engineers and commanding general of the U.S Army Corps of Engineers (USACE). He serves as the senior military officer overseeing most of the nation's civil works infrastructure and military construction.

As the USACE commanding general, Van Antwerp is responsible for approximately 36,000 civilian and 600 military employees, who provide project management and construction support to 250 Army and Air Force installations in nearly 100 countries around the world. USACE has a key role in support to overseas contingency operations, with thousands of civilians and soldiers deployed to support reconstruction in Iraq and Afghanistan.

Van Antwerp took command of USACE after serving, most recently, as commanding general, U.S. Army Accessions Command, responsible for recruiting and training thousands of young patriots who represent the epitome of "Army Strong."

A 1972 graduate of the U.S. Military Academy, Van Antwerp holds a Master of Science degree in mechanical engineering from the University of Michigan and a Master of Business Administration degree from Long Island University in New York.

Van Antwerp was interviewed by GIF *Editor Harrison Donnelly.*

Q: What is "geospatial information," and how important is it to the Army Corps of Engineers?

A: I'll answer the second part first: It is very important to the Army Corps of Engineers, and I'll give a couple of examples. The basic definition, in layman's terms, is that it is any information or data associated with a geographic location, and it also has a time reference. It's got a point in time when it is updated information, or it could be outdated information. That's an important factor. In our world, this could include intelligence information about enemy and terrain, but also, in engineer parley, it has to do with construction materials, perhaps, or information about buried utilities. A lot of people still think GIS is maps, but it's a lot more than maps. To me, it includes everything that is overlaid information, all kinds of data, and is put in the context of location and time. What this can do in essence is provide a very comprehensive, one-stop-shopping common operating picture. It gives a commander and a leader like myself enhanced awareness of the situation. To have all that information in your head would be very difficult, but if you can click on it, bore down into it and see everything that is there, that's good, actionable information. In the end, that's what we're trying to do—give people actionable information to help them make the right decisions and do the right planning.

We have about 110,000 miles of levees in this country, of which about 10,000-12,000 miles are operated and maintained by the Corps of Engineers. We use geospatial data very extensively to enable effective flood risk assessment of all of those levees and the communities whose risk is reduced because they are behind the levees. Also, we do an amazing amount of dredging in our 12,000 miles of inland waterways. In that case, we use an electronic navigation chart, which is mapping that has bathymetric or depth data. That helps us maintain the waterways for navigation. At any given time, once our survey boats have gone out, you can tell the navigation community what kind of water they have underneath their keel.

A third example has to do with our permitting process. We have a regulatory arm in the Corps of Engineers, and we use this information to give accurate location of a permitted activity. It also helps when we determine the proximity to sensitive areas. If we have done a lot of permits in an area, and it's a sensitive ecosystem, that is very valuable data. Those are just a few of the hundreds of examples of how we use geospatial data and information in the Corps of Engineers.

Q: There is a plethora of programs, platforms and other geospatial technology available to the Department of Defense today. How have they helped, or hindered, the Corps' ability to accomplish its mission?

A: This is kind of a two-edged sword, because there are so many programs that are able to carry geospatial information. It's essential to integrate them so that all the information about a particular place in time is accessible. Given the complexity of that, it will be our ability to exploit that and get the right resolution. If you want line of sight, for example, you have to have very detailed resolution. We have to have something that a battalion commander can say, I've got all the pertinent data that I need right now. When you have so many systems, there is always the question of whether you could get more data—do I have all the information I need? We need to meld these and bring them in, so that we've got one common operating platform for the decision-makers.

Our engineers do a great job. We've got geospatial engineers out there, and they take all of this information to create decision aids. What that means in a lot of cases is that they have to tailor these products to support the unit's needs. It is complicated. Part of what the Geospatial Governance Board, where I am a co-chair, is doing is to get standardization and procedures embedded in our battle command business. We take this plethora of programs and platforms and boil the information down for our leaders.

Q: How is the Army Corps of Engineers working to integrate battle command and geospatial technologies for the commander?

A: We've got our eyes on the commander. If we do this right for the commander, it will help everyone. We really want to get that part right. We have the Geospatial-Enterprise Governance Board, where all services are represented. We have NGA and all the big players in the geospatial world. What we're trying to do is establish policies, standards and coordinating requirements that will ensure the synchronization needed by battle commanders. We have the product developers who are developing the systems and vehicles that people ride in, which have battle command networks, working to make sure we get this right. One area I'd like to highlight is the fact that we're operating a lot in complex urban terrain. We find that there are some products that soldiers and leaders really need which require a very high fidelity look at the situation. For example, if you're planning a helicopter landing zone, you need to know the height of nearby building and walls, and where the rotors are going to go. If you're trying to do line of sight for sniper activities, both offensive and defensive, you need to be able to have the right kind of resolution to see that very clearly. USACE has the Buckeye program, which is providing very high resolution, geometrically precise, high fidelity elevation data to commanders. It has been very helpful in Iraq and Afghanistan. It is being targeted at battle command, and we're trying to make sure we have the right fidelity so that it's really useful information—not just if you have rolling terrain or mountains, but you can really see in complex urban terrain.

Q: Soldiers returning from Iraq and Afghanistan say that commercial off-the-shelf programs like GoogleEarth represent some of the most valuable geospatial technologies available to them. If this is true, then why does the Army need to develop and deploy comparable systems and geospatial engineers?

A: At the Army Geospatial Center, they're partnering with NGA to come up with the Geospatial Visualization and Enterprise Service, which is Google-like. But we depart from Google in that we have to have much more mission-specific maps and other products. We've taken the best of Google, and then gone to another level, where it becomes really useful to military decision-makers. It includes such things as line of sight, artillery slope determination, helicopter landing zones and transportation safety route overlays. What we're trying to do is to aid commanders in making tough decisions. The geospatial engineers play a very important role in managing this mountain of information, and also to translate that into products that will be useful to the commander and can be overlaid on a geospatial product. We want the Google-like capability, but we want to go much deeper and meet the needs of the commanders out there.

Q: What can geospatial intelligence do to improve military battle planning systems?

A: Geospatial information is a great tool for that, and I wouldn't even begin to go into the planning mode without it. But we've got to help them by getting this plethora of information systems so that they can really be used. So we are engaging the people who are helping us make these products so that we have data sharing on a level we have never had before. We're working hard on the merger of two key areas—operations and intelligence. Actually, there is also a third area, which is the data. For example, if engineers have to build a road in Afghanistan, we need to know where there is "borrow" material—where is the gravel, and where is the source of water? You have to bring that all together. We're working hard on the foundational level. In the old days, we said that was your map, but today the foundation has to have a lot more detail than that to really be useful. It has to be one that you can point and shoot, and get the data you need from an area, and then move on. We have it in our mind: How do we help the planners and decision-makers?

Q: Please explain the Corps' campaign plan and how it incorporates geospatial assets into its services to the warfighter.

A: We developed our campaign plan a couple of years ago. It really is our visioning document, which I talk about in terms of a jigsaw puzzle. It paints the picture of where the Corps wants to go. It's a pretty simple plan, because the best plans are simple. If you can't get it on one page, you probably have too much detail. Our campaign basically has four goals. The first has to do with supporting overseas contingency operations, and also with responding to disasters. We've been fortunate that we haven't had a big hurricane in a couple of years. We're building the New Orleans risk reduction system as a result of Hurricane Katrina, and we want to get through that before we have another major storm.

Goal two is about enduring water resource solutions. We're looking at watersheds like the Mississippi, which you have to look at from Canada to New Orleans. Because there is cost sharing, a lot of that is in conjunction with our partners and stakeholders. The third goal has to do with sustainable and resilient structures. How do we build what we build? Will they be energy efficient? It's all those things I call "build to last." The fourth goal is about people—building a bench and building a Corps that will last, which has the people who will set the standard for their profession.

Where does geospatial fit in? It fits well into all of those. If you're talking about the location of a building, it would be great in the master plan to know where every single building or location is. But the main place where we put geospatial today is under goal one. The goal states, "to deliver USACE support to combat, stability and disaster operations through forward-deployed and reachback capabilities." That goal incorporates all of the things involved in the Army Geospatial Enterprise. It has to do with enabling expeditionary capabilities, and the ability to reach back to the big organization back here, so you don't have to have a lot of people deployed, but the right people deployed who can reach back. Then we put all of that on geospatial platforms. For example, we've had numerous bridges in Iraq and Afghanistan that have been damaged. So on a geospatial platform, we know the exact location of those bridges. If you click on those bridges, you get pictures that were sent back, the designs of the bridge and then the "as built." That's amazing, and that's where the geospatial fits in. A lot of it is in response to the warfighter, which is in goal one.

Q: Is there anything else you'd like to add?

A: We live in exciting times. I recently spent a couple of days at the AUSA conference, and when you walk the floor of the show and talk to the big vendors and contractors, you see a lot of geospatial activity development. I left there thinking that most of the solutions of what we want to get at are here today. But what we have to do is match the resources up with the solutions, so we can accelerate their acquisition and deployment to the field. The other part is that we have to continually work toward the goal of providing the soldier with the absolute best situational awareness that we can. I'm very confident that the developmental community is getting at this, and the solutions are out there. Now we have to take advantage of them. ★

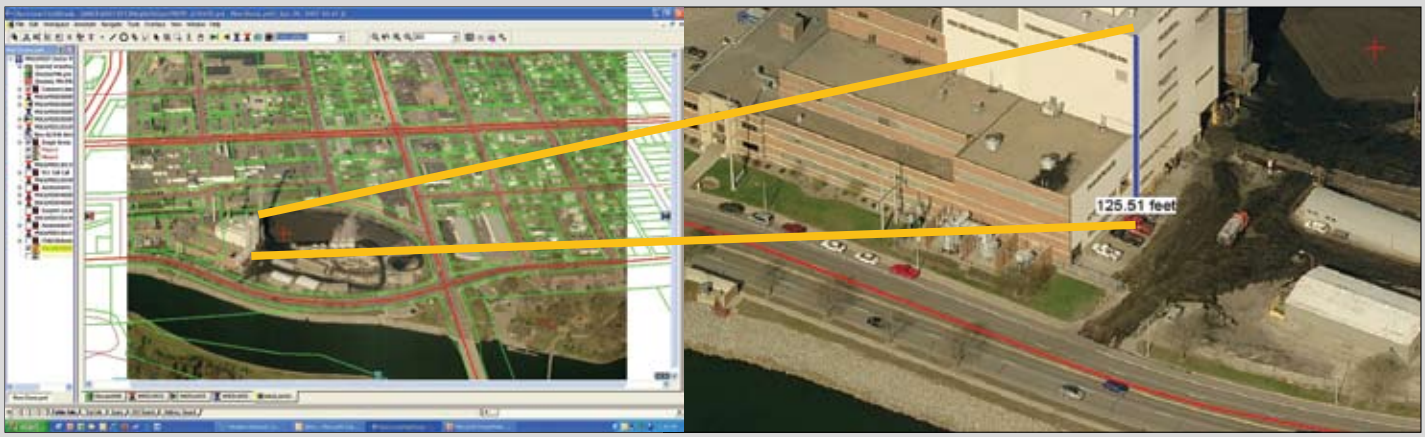
Imagery Access

Web-based service offers 8.5 petabyte database of more than 130 million images.

By Art Kalinski

Mapping and image navigation sites such as Google Earth and Microsoft Bing have become popular in many federal agencies. The sites have exposed a large number of new users to benefits of aerial imagery while demonstrating the power of linked GIS data.

These public access sites present some limitations for federal users, however. Since the sites are intended for entertainment purposes, they contain disclaimers for use in critical applications. Second, the sites are not secure, so it is possible for hackers to "look over the shoulder" of federal users who may not want to draw attention to locations they are viewing. Third, most of the sites contain only ortho or straight down views. This limits the ability of users to quickly comprehend a common operational picture and truly understand all features of a location.



[Photo courtesy of Pictometry International Inc.]

Intelligence on Demand (IOD), a collaborative Web-based imagery service of Pictometry and Lockheed Martin, addresses many of these limitations while providing additional benefits.

Many federal agencies, such as the EPA, FAA, FBI and Secret Service, rarely know day-to-day which location will be an area of interest. Although many federal agencies are headquartered in Washington, D.C., they may have to respond to events anywhere in the world. Managing such a large image library would be costly and cumbersome.

IOD, consisting of domestic and international ortho and oblique imagery, manages and serves Pictometry's 8.5 petabyte database of over 130 million images. The massive database was compressed and indexed for efficient storage and rapid access through a secure "trusted cloud" via sensitive but unclassified (SBU) or, if needed, SIPRNet and JWICS connections. This provides a significant level of security from prying eyes while eliminating the cost and overhead of two petabytes (2,000 terabytes) of storage.

Compared to traditional ortho or straight-down imagery, Pictometry's geo-referenced oblique images show oblique views from four cardinal directions, which significantly speeds human perception of a common operational picture. As a bonus, Pictometry oblique imagery also contains powerful measuring and analysis tools with a GIS overlay capability that is changing the nature of visual intelligence.

The Web service can be easily learned by users with no GIS experience in less than an hour. The system manages the imagery, imports GIS data and overlays the data on the ortho and oblique imagery. The software also has tools to accurately display latitude/longitude, measure length, width, areas, angles, irregular distance, ground elevation and, unique to oblique imagery, the heights of objects in the imagery. Additionally, GIS data layer attributes can be queried, and the images can be annotated and quickly exported as simple JPG images for collaboration with other agencies.

Since IOD is a true Web service, no software is loaded on the user's computer, which avoids certification issues. Additionally, users of ArcGIS Ver 10 can view the IOD imagery overlaid with GIS vector data directly in ArcGIS.

IOD also provides a historic perspective, in that all imagery ever captured by Pictometry is in the database. This permits a user to view the most current imagery of a location

Ortho imagery usefulness is limited in that it takes a trained analyst to fully understand what the imagery is showing. Note this ortho image with the building at the lower left. What is it? [Photo courtesy of Pictometry International Inc.]

The oblique image clearly shows it to be a parking garage. The views from four cardinal directions also show that the garage is built on the side of a hill, a characteristic that would not be visible in a straight down ortho view. Additionally, thin vertical features such as light poles show up well in the oblique view but would be difficult to spot in an ortho view. [Photo courtesy of Pictometry International Inc.]

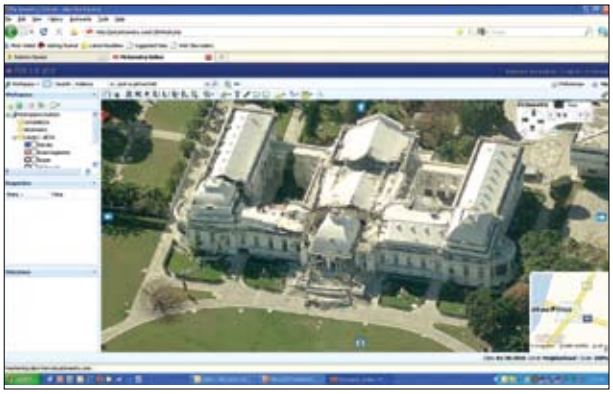
The clarity and detail of oblique imagery is demonstrated by the visibility of 1/4 inch guy wires leading from the mast of the USS *Wisconsin* at the Nauticus Museum in Norfolk, Va. [Photo courtesy of Pictometry International Inc.]

and, if available, imagery taken in previous years of that exact location. As the Pictometry library grows, new imagery will be added while the older imagery will still be available for comparisons.

The ability to accurately measure objects in the imagery is possible because of a patented process that scientifically captures the geographic location of each pixel in each image. This rich dataset permits even more sophisticated analysis and processes beyond just simple measurements, including the fast creation and delivery of interactive 3-D models.

Pictometry can also provide high accuracy imagery that meets National Map standards. Most important, work is in progress to place Pictometry cameras and technology into the hands of operational forces in-theater including areas with limited or denied accessibility. This imagery can also be placed on IOD and fenced based on classification (SBU, SIPERNet or JWICS) to be shared by multiple users. ✯

Art Kalinski, GISP, is federal sales director-defense for Pictometry International Corp.



Pictometry provides a rapid solution for emergency response worldwide. Here is an example of the collapsed palace in Port au Prince, Haiti, the day after the earthquake shown on Google. Compare the same palace a day later on IOD.

The usefulness of oblique imagery is not limited to urban areas. It is equally valuable in understanding terrain and the features in the terrain. Note this example near the border crossing near Calexico, Calif. The ortho view of the irrigation pipes can't show the terrain and features as well as the oblique views. [Photo courtesy of Pictometry International Inc.]

USGIF Would Like to Congratulate the Winners of its 2010 Awards Program

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Ms. Donna Bridges, Penn State University

ACADEMIC RESEARCH AWARD
Dr. Dennis J. Bellafiore, Senior Lecturer, Department of Geography, John A. Dutton e-Education Institute, Penn State University

GOVERNMENT INTELLIGENCE ACHIEVEMENT AWARD
The Department of Homeland Security's U.S. Customs and Border Protection Enterprise GIS Team

MILITARY INTELLIGENCE ACHIEVEMENT AWARD
U.S. Central Command's Human Terrain Analysis Branch

INDUSTRY INTELLIGENCE ACHIEVEMENT AWARD
Mr. Steve Panzer and Mr. David Hemphill, ObjectFx

The USGIF Awards Program annually recognizes the exceptional work of the geospatial intelligence tradecraft's brightest minds. The Intelligence Achievement Awards, the Academic Achievement Award and the Academic Research Award are open for all community members to apply. The Arthur C. Lundahl Lifetime Achievement Award is presented, upon selection by the USGIF board, to an influential member of the geospatial intelligence community who has dedicated their work to the tradecraft. All award recipients are acknowledged for their contributions on stage during the annual GEOINT Symposium. For more information on the USGIF Awards Program, contact awards@usgif.org or visit our website at www.usgif.org.

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GEOINT in the Cloud

Cloud computing may be the wave of the future, but the geospatial community is still considering how to use it most effectively.

Editor's note: Geospatial Intelligence Forum recently posed the following question to some of the leading companies in the GEOINT field: "What role will cloud computing play in the future of geospatial intelligence?" Following are their responses.

GEOINT Future

Cloud computing will put the production of GEOINT products into an efficient and automated assembly line process.

By Kevin L. Jackson
kevin.jackson@njvc.com

Cloud computing is the future of geospatial intelligence. Through the processing, exploitation and dissemination process, GEOINT links data about a specific place to a specific time. The goal of this linkage is to create actionable information, and success is often a matter of having sufficient information technology resources. While cloud computing is not a revolution in technology, it does represent a step change in how IT resources are provisioned, accessed, manipulated and consumed. If leveraged properly, this new approach will greatly enhance our ability to create actionable GEOINT.

Cloud computing also represents an inevitable transition that some have likened to the Industrial Revolution. During that time, society developed from an environment where products were handmade in cottages to mass production on assembly lines powered by the steam engine. That transition represented a revolution not just to society, but also to the economy and to many other different domains.

What we're seeing with cloud computing is the next step in the information revolution. The hand-built, hand-designed works of art that we call our IT infrastructures are being transitioned to modern, professional infrastructures composed of commodity components run in an automated fashion. We're actually seeing IT infrastructure being put into an assembly line construct. In many ways the production of GEOINT products today resembles the cottage industries of the past. Like the steam engine, cloud computing will put the production of GEOINT products into an efficient and automated assembly line process.

Another key driver in this transition is our ever-increasing reliance on robotic vehicles. The sensors we employ on these vehicles produce hundreds of petabytes of raw digital data on a daily basis. Each and every bit of that data also has a geospatial coordinate. If we fail to leverage the automated information processing capabilities of cloud computing, we will lose the valuable GEOINT that data holds. The use of robotic forces is a function forcing us to use cloud computing techniques and technologies in the production of geospatial products.

The growth of unstructured information will also play an important role in the future use of cloud computing for GEOINT. According to a 2009 IDC study of the "digital universe," interactions between people via e-mail, messaging, social networks and similar media will grow by a factor of eight over the next four years.

The 2010 study concludes that "as much as 15 percent of the information in the Digital Universe in 2020 could be part of a cloud service—created in the cloud, delivered to the cloud, stored and manipulated in the cloud. Even more information could 'pass through the cloud,' that is be transported using a cloud services e-mail system or shared community, be stored temporarily on disk drives in the cloud, or be secured via a cloud service. By 2020, more than a third of all the information in the Digital Universe will either live in or pass through the cloud."

Our ability to glean geospatial content and create actionable intelligence from these cloud-based interactions is crucial to our society's ability to counter the evermore sophisticated terrorist threat. Once again, the automated information

processing capabilities of cloud computing sheds light on the future of GEOINT.

In the end, cloud computing is not just hype. Cloud computing is a transition that we all have become comfortable with. Cloud is not a panacea for everything, so today's challenge is to understand how to use cloud for the things it is good for—and to understand how and when not to use it for the things that we should not. ✯

Kevin L. Jackson is director, cloud services at NJVC.

Aligning with NGA's Vision

GEOINT cloud computing strategy must include a focus on the mission, an eye toward the future, and a commitment to affordability.

By Dan Rice

In her speech at this year's GEOINT Conference, NGA Director Letitia A. Long laid out a clear and compelling vision of providing "online, on-demand access to our GEOINT knowledge." Ms. Long noted that she wanted NGA to "give our customers—from novice to expert—access to our content, our services, our expertise and to our support—and to tools that allow them to serve themselves."

How do we ensure that a GEOINT cloud computing strategy is fully aligned to that vision? From our perspective, we see three key areas that must be addressed: a focus on the mission, an eye toward the future, and a commitment to affordability.

Start with the Mission

Director Long's vision centers on not only broadening the range of GEOINT services available to support the mission, but also changing the way diverse users interact with geospatial intelligence. That has two important consequences for a cloud strategy.

First, the cloud must be accessible to a wide range of stakeholders, from traditional GEOINT consumers to a new generation of troops, analysts, state and federal agencies, coalition partners, first responders, and international relief organizations. That means that the cloud architecture must balance security with far-reaching collaboration. A hybrid cloud approach—one that includes both a private, government-run cloud and a public Internet-based cloud—could be a preferred approach, but it is not without challenges.

In an era of increasing concerns over unauthorized disclosure of sensitive information, a comprehensive security approach including policies, architecture and cross-domain security services is of paramount importance. The cloud's security capabilities must provide complete situational awareness of where critical information exists throughout the cloud, and who is accessing it.

The second important consequence has to do with the user experience. NGA envisions an "app store" model with online applications for both simple and sophisticated GEOINT tasks. That means a GEOINT cloud must be equipped to deliver software as a service, with potentially hundreds of applications and common services hosted on the cloud for all users to enjoy.

NGA's current infrastructure service provider/application service provider model fully supports this approach. As we move into the cloud, it will be important to keep a common set of standards and an open architecture, so that any authorized user, in government or industry, who wants to write and publish applications can do so quickly and affordably. Because cloud computing is still evolving, it is important to establish a dialogue now around the right standards for the future.

Build for the Future

Implementing a cloud model will be a long-term commitment. Any cloud architecture must be scalable and flexible enough to handle the rapidly evolving demands of GEOINT users. The increasing thirst for full-motion video and the proliferation of new sensors are driving ever-increasing demands for storage space. The GEOINT cloud must be able to smartly manage an enormous volume of data and support automated implementation of defined data retention and archival policies. That means the GEOINT cloud must have a federated architecture that combines multiple databases under a single umbrella, and provide powerful single-point search and access capabilities for users.

Optimize for Affordability

Clearly, in this new reality of limited resources, any new technology venture must make return on investment a top priority. The GEOINT cloud must be designed with efficiency and affordability in mind from the start. That means making measured trade-offs on capability vs. cost, and designing a phased roll-out that delivers cloud capability in stages while maximizing returns on the existing infrastructure investment. Lockheed Martin and its Cyber Security Alliance partners are working today to define what affordability means for elastic cloud computing, and to adapt commercial systems, approaches and governance policies for government use.

Turning Strategy into Action

We're working with the Net-Centric Operations Industry Consortium (NCOIC) to help develop a cloud roadmap for the geospatial community—one that is built on open standards, designed to grow and evolve, and created for affordability. NCOIC provides an outstanding forum to bring together the key players from government and industry in a collaborative forum to shape strategy, frameworks and future direction.

This group is helping pave the way for a future that will deliver Ms. Long's vision for online, on-demand GEOINT. We're proud to be a part of this effort and look forward to collaborating with the entire geospatial community to realize the full power of the cloud. ✯

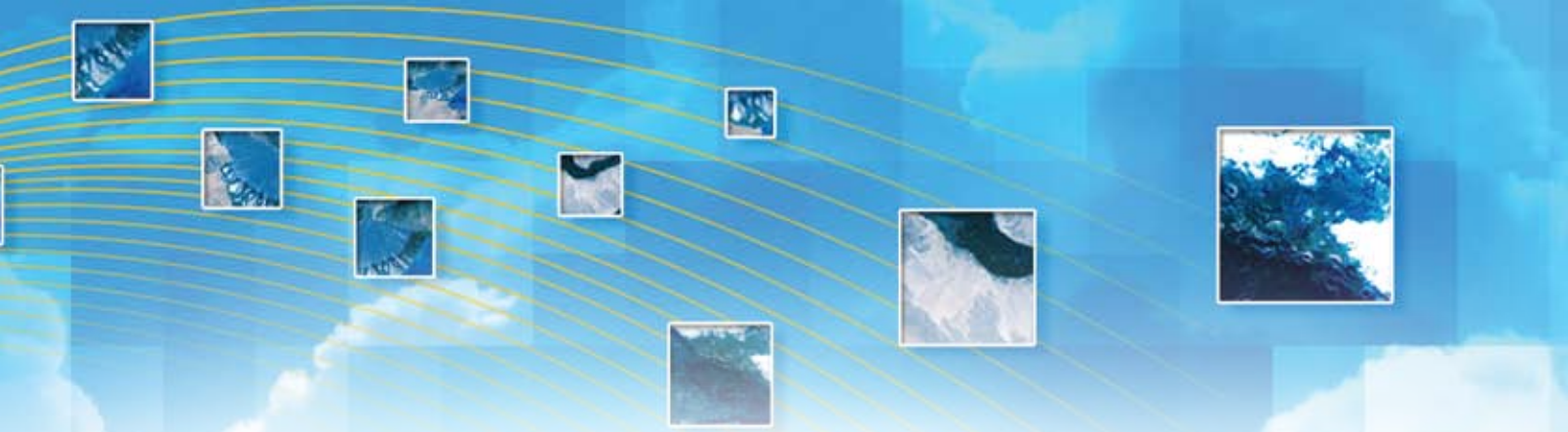
Dan Rice is vice president, spatial solutions for Lockheed Martin.

The Storage Cloud

Solutions offer an effective approach to managing, disseminating and storing geospatial data.

By Howard Levenson, Scott Fadden and Gabe Chang

New sensors are driving exponential increases in the volumes of data, straining storage, data management and dissemination systems. While volumes are increasing, the geographic collection and dissemination points of the data are becoming more dispersed. Imagery that once was down-linked directly into the United States from satellites is now complemented by full motion video, captured in various locations around the world on aerial surveillance vehicles.



Analysts, once located only in the continental United States, are now being deployed around the world. In the past, separate systems were required to store, catalogue and to disseminate the data. Cloud storage solutions introduce a new approach to global data management providing all of these functions, and greatly simplifying the task of managing the data workflow through its life cycle.

The idea around cloud storage is to develop a system that incorporates location-independent resource enclaves and allows information to migrate transparently between these enclaves based on policies that prescribe future needs. Information in the cloud could be temporarily or permanently migrated or replicated to provide continuous operations, support disconnected operations and offer improved performance.

The benefits of cloud could be significant. Data is omnipresent. For example, data ingested in Asia could be immediately available around the world. The need to transfer all the information via networks is optimized, transferring only the data that is necessary.

The cloud could also support disconnected operations in the event of network failures, enabling users in remote locations to continue to read and write from local storage and then re-synchronizing the data when the network becomes available again. The cloud could be tuned via metadata-rich policies to make sure that the analyst has the appropriate data regardless of what is happening in the world, wherefore a change in the world could drive a new policy, accelerating the critical data to the critical analyst locations.

IBM scientists and researchers have been hard at work building the technologies to deploy such a storage cloud. In addition to the normal storage requirements for resiliency and ease of use, the "storage cloud for geospatial data" should consider these intrinsic characteristics: capacity, performance and automated management.

Massive Scalability

Today's systems scale in capacity to several petabytes. In the near future, sensors will be delivering petabytes of data virtually every day. Traditionally, geospatial users have simply acquired additional islands of storage by buying additional systems. This model of growth adds directly to administration costs as capacity increases. Typically these systems cannot share resources, resulting in isolated data repositories, hotspots and considerable management challenges.

A cloud solution ideally should scale horizontally, adding capacity and performance as it scales. This vast capacity should be managed centrally and as a single environment to reduce management cost and complexity. It should scale in capacity through geographic dispersion, eliminating the need to build a single data center which can accommodate everything now and into the future. Pushing processing to the edge, applies to the data too.

Massively scalable in performance. High performance storage is required to support new data types. High definition, full motion video requires a constant bit rate delivery system so that the video can be displayed smoothly. High performance storage, coupled with a high performance compute system, offers the potential to reduce the overall amount of stored data. In today's systems, a single image may need to be delivered in several different formats. A high performance compute and storage infrastructure can do real-time format conversions delivering the data in the right format without storing various copies of the same file. It is also clear that with this amount of data, new filtering techniques, processing capabilities and analytics are required to exploit the data. All of these approaches require a sound, high performance storage subsystem to support the enhanced processing.

To provide scalable performance the most effective approach is to parallelize everything. If there is a bottleneck, parallelize it. Parallelize the lock manager so that multiple users can write to the same file simultaneously. Parallelize the layout of data so that all of the system resources can be simultaneously exploited to achieve the maximum level of performance. The result of this parallelization is a system that scales performance as capacity scales, by load balancing the workload across all of its resources.

Effective metadata management. Most agree that storing geospatial data is best done on a file-based rather than a block-based system. It is generally easier to manage the data when the storage system has the context of "what the data is." In a file-based system, the storage system knows the relationships between the blocks on disk and the file that they belong to. This information is stored in the file system metadata. Traditional file metadata based on the POSIX standard contains information about the files, including the file name, type, user, time of last access, and the location of all of the pieces of data that make up this file. Knowing this data helps in managing the data and optimizing its performance.

While this data is helpful, it would be much more helpful if the file system were aware of the geospatial metadata as well. POSIX has standards for "user extensible meta data," and it would be ideal if one could add the geospatial metadata to the file system along with the traditiona metadata. The idea is to give the storage system more information about the data so that the storage system can manage the data on the administrator's behalf. The slogan could be, "data management through intelligent data."

Fast metadata scans. It's great to have file metadata, but it is only useful if you can effectively use the metadata to quickly find the files that meet your search criteria. In traditional NAS systems with 500 million files, it could take a full day to scan an entire file system. The idea for cloud storage is to parallelize the metadata across all of the storage and allow it to be searched in parallel by all of the nodes. As a current pioneer in fast metadata scans, IBM has built systems that can scan the metadata of 1 billion files in less than 15 minutes, and ongoing benchmarks suggest that can be improved to perhaps 10 billion files in 45 minutes. So, if you have built a massively scalable system with extensible metadata that can be scanned very quickly, how do you leverage those characteristics to help manage the data?

Tiering between storage classes. If money were no object, all data would be stored on the fastest storage available, replicated remotely and never moved. But the facts are that different storage media have different performance, reliability and environmental characteristics. Certain data types might perform equally well on inexpensive slower SATA disks if striped appropriately, as it might on solid state disks. It might be acceptable to move data to slower and more environmentally efficient media when it is less frequently accessed and a slight delay could be tolerated.

The cloud storage system should have the ability to automatically, based on policy, migrate the data to the appropriate media at the appropriate time. Sample policies might be:

- All database journal and log files shall reside on solid state disk all the time.
- All new imagery shall reside on high speed expensive disk, and migrated to less expensive disk if not used for 180 days.
- If full motion video performs equally well on lower cost disk, stage the data to that disk as it is ingested.

With extensible metadata, policy based examples of staging include:

- If the data has a country code of Haiti, move it to tier 1 regardless of where it currently resides.
- If the data is 90 days new and the lat/long in the file metadata is in the area of responsibility for a combatant command, place a cached local copy at the COCOM for faster access and to support disconnected operations.
- If a decision is made to disseminate critical data to a stand-alone Army unit, start by accessing a variety of standard National Geospatial-Intelligence Agency products in the cloud, including compressed arc digitized raster graphics, vector map, digital terrain elevation data and digital aeronautical flight information files, LiDAR imagery, information in the GIB, and precise targeting data. Then compress that down with "MrSid," and finally burn from the local cache onto DVD, to deliver to the warfighter.

The power of extensible metadata, fast metadata scans and policy-based data management allows for cost-effectiveness, environmentally efficiency and high performance, and is perfectly suited to optimize the system for the temporal nature of intelligence analysis.

Obsolescence control. Data governance is a key component to any management strategy. Current laws require certain data types to be stored for 30 years if the data is used in an intelligence product. Since the typical life of media is less than five years, it's likely that most data will have to go through a half-dozen migrations during its lifetime. Data migration on many of today's systems results in extended periods of downtime. The same cloud approach that abstracts the data during migrations between tiers can be used to migrate data from old media to new media, eliminating downtime and eliminating most operator intervention.

Truly distributed global name space. The cloud abstraction offers many interesting capabilities that are quite superior to today's systems. The cloud expounds on this theme in that there are storage enclaves that exist in various key locations throughout the world. All of the enclaves connect together to create one data repository with a single global name space. Wherever they are in the world, users can access any of the data in the cloud. When accessing data remotely, a copy of the requested file is retrieved to the local cache, making subsequent access faster. Any new data written to the cached location will be replicated to the home site as well. This approach defines a demand-cached environment. The cloud should also leverage the policy-based migration strategies enabling information to migrate data closer to the user based on the anticipated user requirements.

Parallel File System

The IBM cloud storage solution implements all of the characteristics articulated within. Virtually all of the technology and approach

comes from the IBM Research organization, and is based on a parallel file system called the General Parallel File System (GPFS). GPFS has been perfected over the past 15 years and is installed in virtually all industry segments including financial, media and federal customers. It runs the gamut of applications from high performance computing to database online transaction processing to online video editing in high definition video suites.

While GPFS is great at consolidating data, a key principle is using its "shared nothing cluster." In fact, it was this capability that helped win first place at this year's Supercomputing 2011 Conference. The shared nothing cluster is a core principle of new analytics techniques like map-reduce (Hadoop). GPFS in a map-reduce environment could offer many management and performance benefits, including replication, backup, and an ability to manage the data that is well beyond the capabilities of the traditional Hadoop File system (HDFS). Integrating the cloud capabilities and the shared nothing components is a powerful combination that will allow geospatial users the ability to add advanced analytics to the cloud.

IBM practically invented the storage business over 50 years ago, and has been doing research on advanced storage challenges ever since. This includes the invention of the first magnetic hard drive and the "Winchester drive" that is commonly used today in all storage systems. Today, IBM employs over 100 researchers exclusively focused on storage and data management, and annually generates approximately 500 storage-related patents. IBM's experience in building innovative grand challenge storage solutions is supported by 15 development labs, over 100 dedicated storage researchers and a solely storage research and development budget in excess of $500 million annually.

In 2011, IBM will deploy a storage system for a new Defense Advanced Research Projects Agency supercomputer that will scale to 100PB in a single filesystem with 1 trillion files, delivering mind-boggling performance characteristics, including 4TB/sec aggregate bandwidth.

There are many capable storage systems and vendors in the marketplace today. Building a system to manage the global distribution and management of geospatial data is considerably different than the storage system required to run a financial accounting system. IBM's cloud storage system has been built to handle this problem explicitly by combining the storage, data management and geographic dissemination in one comprehensive, easily managed system. ✯

Howard Levenson, Scott Fadden and Gabe Chang are with IBM.

Contact Editor Harrison Donnelly at harrisond@kmimediagroup.com. For more information related to this subject, search our archives at www.GIF-kmi.com.

Compiled by KMI Media Group staff

Geoportal Server Offers Framework for Data Sharing

Esri Geoportal Server is a free, open source product that helps organizations manage and publish metadata for their geospatial resources that others can then discover and use. Geoportal Server can act as the nexus for an international framework of spatial data resources for enhanced collaboration and data sharing among various government and private agencies. With Esri Geoportal Server, users can: reduce time and redundancy of data production by connecting geospatial data and service producers with consumers; maintain data integrity by easily sharing the authoritative version of data throughout an organization; and easily search and discover existing geospatial data and services by creating and managing descriptions of their geospatial resources and supporting easy-to-use, sophisticated data discovery technologies. Esri Geoportal Server supports standards-based clearinghouse and metadata discovery applications. It was released under the Apache 2.0 license, which allows developers to customize and redistribute the software. Esri is using SourceForge to host and distribute the software and source code. This familiar platform will make it easy to incorporate contributions from the open source community to the product.

Digital Elevation Dataset Helps Meet Emergency Water Guidelines

Intermap Technologies, a worldwide 3-D digital mapping and geospatial solutions company, has announced that its NEXTMap USA IFSAR-derived digital elevation dataset is a potential source of data to satisfy the recently released FEMA guidelines for accuracy and density for low and medium risk specification levels within watersheds. NEXTMap USA data, which provides coverage for the contiguous United States and Hawaii, is available immediately and is less expensive than many higher-accuracy datasets on the market. NEXTMap USA's high-resolution digital terrain model (DTM) is hydro-enforced, with elevation points removed from the tops of bridges, culverts and other selected drainage structures—perfectly suited for many Risk MAP updates throughout the country. Additionally, the metadata within the NEXTMap USA DTM is fully compliant with Federal Geographic Data Committee standards and is easily incorporated into FEMA's Mapping Information Platform via a simple documented process provided by Intermap. Furthermore, the company's production, quality assurance and quality control processes are certified according to International Organization for Standardization 9001:2008 standards.

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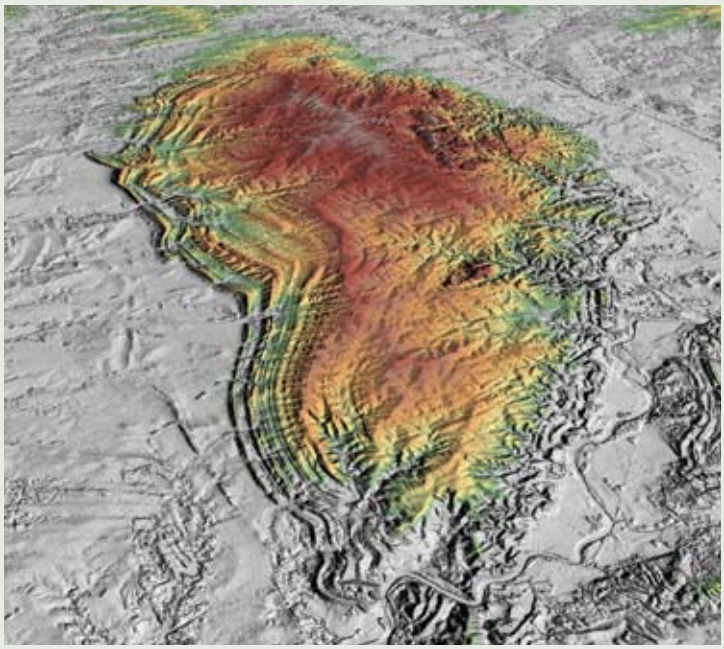

Urban Change Indicator Shows New Construction

MacDonald, Dettwiler and Associates has released a new geospatial product, the National Urban Change Indicator, initially covering the lower 48 U.S. states. Using satellite imagery, the product shows if, and when, an area has undergone a human- induced change sometime in the last 25 years. These changes are generally new or changed construction. The Department of Homeland Security/Federal Emergency Management Agency has purchased an agency license. The product is created using the correlated land change proprietary process developed by MDA over the last three years.

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Standards Group Offers Membership Option for State/ Local Governments

The Open Geospatial Consortium (OGC) has announced a new revised associate membership option for local and state/provincial government agencies worldwide. The new OGC GovFuture membership category reflects the OGC's increased emphasis on knowledge transfer as OGC standards become widely accepted in the marketplace. The OGC GovFuture membership category includes local government and subnational government membership levels. It offers public sector organizations an opportunity to learn about and benefit from new developments in geospatial technology, and to understand and address legal and policy issues related to these technology developments. GovFuture provides an opportunity for government organizations across the globe to discuss common issues related to the new level of interoperability enabled by open standards. GovFuture provides a platform for peer-to-peer knowledge transfer among local and subnational governments to advance wider use of the standards. GovFuture members have an opportunity to liaise with other levels of government and with suppliers and universities through OGC meetings and channels for focused discussion. GovFuture members also have access to OGC resources such as white papers, international best practice reports, webinars and domain working groups.

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NEXT ISSUE

Volume 9, Issue 1 • February 2011

Geospatial Intelligence Forum

Cover and In-Depth Interview with:

Paul Weise

Director,
Office of GEOINT Management
NGA

Features:

- Industry Roundtable: LiDAR
- Distributed Common Ground System
- Human Social Culture Behavior Modeling
- National Guard GEOINT

Insertion Order Deadlie: **January 21, 2011** • Ad Materials Deadline: **January 28, 2011**

Calendar

January 19-21, 2011
Esri Federal User Conference
Washington, D.C.
www.esri.com

January 24-27, 2011
DGI 2011
London, U.K.
www.wbresearch.com

February 7-9, 2011
International LiDAR Mapping Forum
New Orleans, La.
www.lidarmap.org

April 9 -14, 2011
NAB Show
Military and Government Summit
Las Vegas, Nev.
www.nabshow.com/milgov

May 1-5, 2011
ASPRS Annual Conference
Milwaukee, Wis.
www.asprs.org

Stephen Wood
Vice President, U.S. Defense and Intelligence Programs
DigitalGlobe

Stephen Wood joined DigitalGlobe (previously known as EarthWatch Inc.) in July 2000 after working for nearly 14 years with the Central Intelligence Agency, and has held a range of defense sales and marketing positions at the company ever since. Prior to joining DigitalGlobe/EarthWatch, Wood served from 1998 to 2000 as a special assistant to the executive director, CIA. In this position, he was instrumental in developing and organizing the agency's Visual Information Initiative, a multi-million dollar program to acquire, store and exploit digital imagery data at CIA. He also helped provide imagery analytic expertise and insights for CIA senior leadership to enhance interaction and coordination with the former National Imagery and Mapping Agency.

Immediately prior to working for the executive director, Wood served as a staff officer for the Community Management Staff. He was the executive secretary of the National Intelligence Collection Board and chaired an interagency study team examining imagery exploitation shortfalls in the intelligence community, which culminated with a summary report with recommendations to the director of central intelligence. Wood previously served as the executive officer of the former Central Imagery Office and also held a variety of senior imagery analytic positions with the former Office of Imagery Analysis and the National Photographic Interpretation Center. Additionally, he served in an interim assignment as a Conventional Forces in Europe Treaty inspector.

Q: It has been a decade since commercial satellites were first introduced. How have they changed the way the defense and intelligence community operates?

A: We—the industry—have come a long way technologically. Much like the new director of NGA recently said about her organization, "No one will go to war without us, no one will manage a humanitarian crisis without us and no one will respond to a natural disaster without us." When one considers how far we have advanced in being

able to offer better imagery resolution, substantial imaging capabilities and the sheer volume of data delivered to defense and intelligence customers, I believe our capabilities have improved significantly in the 10 years that I've been involved in the commercial imagery business.

Q: What were some of the most important developments in commercial satellite imagery for the defense and intelligence community in 2010?

A: Delivering our imagery into the hands of our users—wherever they may be—quickly, efficiently and in a simple manner has been an important development this year. In particular, we are providing the real benefits of commercial satellite imagery—high quality, unclassified, accurate geospatial data—to forward-deployed GEOINT users.

Q: What are some of your proudest moments in the industry, when digital imagery really made a difference?

A: Unquestionably when we have been able to provide our imagery for crisis response. Over the years, we've been involved in quite a few crises around the world. We started 2010 by responding to the Haitian earthquake, which I look back on as an important and defining moment. Immediately after the earthquake occurred, DigitalGlobe imaged the entire country of Haiti in a single day, using our three satellites. Getting that information out to the U.S. and other governments, to nongovernmental organizations and relief officials, impacted lives.

Q: What are your customers now asking that you develop and deliver?

A: Today, it's all about what our users can do with the imagery, what additional and valuable information it can provide. We're also finding it's important to deliver options for storing, managing and disseminating data. Our customers want to use and integrate the full extent of our current and historic imagery content and employ the power of our Internet and cloud services without having to buy and manage additional data storage architectures.

Q: What are some of the newer products and services DigitalGlobe expects to offer in the coming year?

A: We have a busy year ahead of us! We're offering:

- Our Advanced Visualization series, incorporating three-dimensional capabilities to provide even more visually interpretive image products and services.
- Our Assured Monitoring Series. With our constellation of three submeter resolution satellites, we can image and revisit areas of the world that are of highest interest to our GEOINT customers. In the current Korean crisis, for example, we've been imaging the area and providing imagery to our customers every day since the event occurred.
- A full scope of capabilities from our WorldView-2 commercial satellite. By taking full advantage of our newest satellite's unique eight multispectral bands, we are providing our customers with more geospatial information and substantially better insight about all kinds of activity on, and in some cases below, the earth's surface. ✯

Geospatial Intelligence Forum

KMI 2011 Editorial Calendar

Issue	Cover Q&A	Special Section	Features	Trade Shows	Closing Date
FEB (9.1)	**Paul Weise** Director, Office of GEOINT Management NGA	Industry Roundtable—LiDAR	Data Fusion Ground Systems; Geospatial Modeling	International LiDAR Mapping* (2-7)	1/28
MAR (9.2)	**LTG Ronald Burgess** Director DIA	Industry Roundtable—Full Motion Video	Cloud Computing Human Terrain Automated Feature Extraction	TBD	2/25
APR (9.3)	**Peter Rustan** Deputy Director for Mission Support NRO	NRO Agency Profile	Satellites Visualization Computer Hardware	National Space Symposium* (4-11) NAB* (4-10)	3/25
MAY/ JUN (9.4)	**James Clapper** DNI	USGIF Membership Directory	Commercial Remote Sensing Analytic Software Standards	USGIF Tech Week* (May) ASPRS* (5-1) DoDIIS (5-1)	4/22
JUL/ AUG (9.5)	**Barry Barlow** Director NGA Acquisition Directorate	Industry Roundtable—GIS Software	Aerial Imagery Security Dangermond profile	Esri International User Conference* (7-11)	6/24
SEP (9.6)	**MG Mary Legere** Commanding General Army INSCOM	INSCOM Command Profile	Mapping Image Processing Wide Area Surveillance	AFA (9-19) AUSA (10-10)	8/26
OCT (9.7)	**Dawn Meyerriecks** Deputy Director of National Intelligence for Acquisition and Technology	GEOINT Symposium Event Guide	Web-Based Delivery EO/IR Sensors Content Management	GEOINT Symposium 2011* (10-16)	10/3
NOV/ DEC (9.8)	**Vice Admiral David Dorsett** Director Naval Intelligence	Industry Roundtable—Maritime Domain Awareness	Multi-Sensor Data Position, Navigation and Timing Display Technology	Esri Federal Users* (Jan. 2012)	12/2

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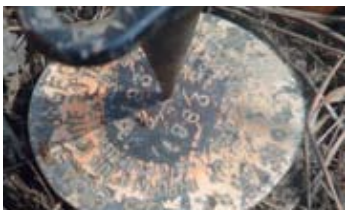


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